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www.3DArtistonline.com

3DArtist

62

Practical inspiration for the 3D com

MASTER THE ART OF SCI-FI CG

CREATE STUNNING HI-TECH IMAGERY

Get the most out of your futuristic designs with our 50 professional tips

BEHIND THE SCENES OF GRAVITY

Framestore discusses its incredible VFX triumph

The MODO to NUKE pipeline

Tackle the modelling to compositing workflow

PRO CREATURE RENDERS

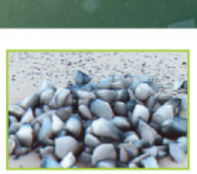
How Animal Logic re-created the Cretaceous period in Walking With Dinosaurs 3D

Rigging explained

Create animation-ready character assets

3ds Max simulations

Harness the full power of particles



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Artist info

Fausto De Martini

Personal portfolio site
www.faustodemartini.blogspot.com

Location USA

Software used
ZBrush, 3ds Max, Marvelous Designer, V-Ray

This issue we talk to top videogame and Hollywood concept designers about their approach to sci-fi CG. We also go behind the scenes of Framestore's VFX triumph Gravity, *and talk dinosaur renders with Animal Logic. You'll also find tutorials on Maya, NUKE, Blender and more*

“The Deployment Unit is used for fast drops in areas where there is civil or military tension. Equipped with state-of-the-art gear, it is fast to respond and accurate in engagement”

Fausto De Martini discusses his work **Page 110**

Master the art of sci-fi CG page 24

Discover the secrets of Gravity, page 24

Welcome

to the magazine and 116 pages of amazing 3D

Hello and welcome to 3D Artist magazine! Slipping off our 3D glasses as Gravity came to a close and the credits scrolled up the screen, we were pleased to see that the VFX team received top billing. And rightly so! Gravity presents a new benchmark in visual effects, which is why we went behind the scenes with Framestore, starting on page 24.

We've also got top 50 sci-fi tips for you this issue, so head to page 32 to start learning from top industry experts!

Chris Deputy Editor

Every issue you can count on...

1. **Exclusively commissioned art**
2. Behind-the-scenes guides to images and fantastic artwork
3. **A CD packed full of creative goodness**
4. Interviews with inspirational artists
5. **Tips for studying 3D or getting work in the industry**
6. The chance to see your art in the mag!

This issue's team of expert artists...

Christopher Velez

Create dynamic, exciting designs using Christopher's unique and innovative Maya techniques!

Anselm von Seherr-Thoss

An expert on all things simulation, this issue Anselm takes a look at how to create crumbling characters

Jonathan Williamson

Jonathan concludes his Blender series this issue, putting the finishing touches to his pteranodon model

Martin Mayer

One of the The Foundry's top experts, Martin takes us through the MODO to NUKE pipeline

Jahirul Amin

When it comes to Maya, Jahirul's the man in the know. This issue he rigs the train he created in Maya

Juahni Karlsson

We've got even more MODO content for you this issue, with Juhani taking a look at helpful ways to use replicators

Dave Scotland

Learn to rig in 3ds Max with Dave Scotland. Tune in next issue for the second part of this in depth tutorial

Thomas Lishman

Although ZBrush is a fantastic program for sculpting, it's also a great renderer, as Thomas reveals

Rainer Duda

Our gaming expert Rainer dives into asset creation using 3ds Max and the Unreal Development Kit

Gustav Melich

Houdini 13 released with a whole host of new features, which Gustav examines over on page 96

Orestis Bastounis

Is it worth buying the new MacBook pro if you're a 3D artist? Orestis looks into the issue on page 95

Poz Watson

Poz spoke to top designers in the sci-fi field this issue, bringing you 50 of their top tips and tricks

Sign up, share your art and chat to other artists at www.3dartistonline.com

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Contents

62

What's in the magazine and where

News reviews & features

8 The Gallery
A hand-picked selection of incredible artwork to inspire you

16 Community news
Discover the biggest advancements in the 3D industry in 2013

20 Readers' Gallery
The 3DArtistOnline.com community art showcase

22 Have your say
The best posts and stories from our Facebook and Twitter pages

24 Master the art of sci-fi CG
Top concept designers discuss their approach to futuristic designs

32 Behind the scenes of Gravity
We take a look at how Framestore created the best VFX of the year

40 Walking With Dinosaurs: The 3D Movie
Animal Logic discusses how it re-created the Cretaceous period

72 Subscribe today!
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94 Review: MakerBot Replicator 2
We take a look at this 3D printer to see if it's worth having in the home

97 Review: MacBook Pro
Is the latest MacBook Pro release worthwhile for the 3D artist?

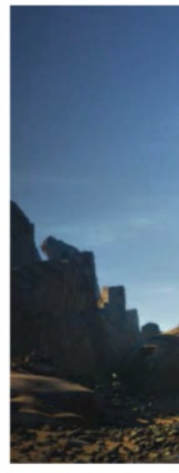
98 Review: Houdini 13
Gustav Melich takes a close look at the latest Side Effects release

24

Master the art of sci-fi CG

"Sci-fi is about whimsy, but if you do your job, the implausible can seem plausible"

Paul Pepera and others discuss their approach to futuristic design **Page 24**



56

Mesh shatter your characters in Maya

40

Walking With Dinosaurs: The 3D Movie

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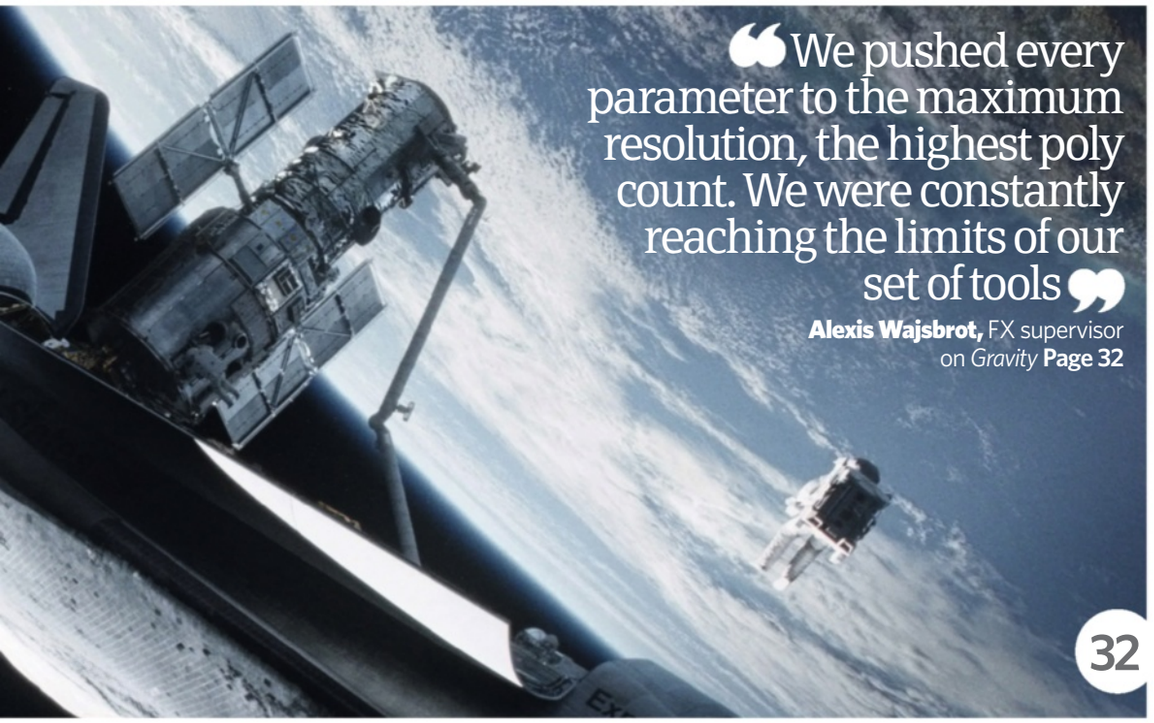
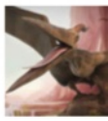

“We pushed every parameter to the maximum resolution, the highest poly count. We were constantly reaching the limits of our set of tools”
Alexis Wajsbrot, FX supervisor on Gravity Page 32
32

The studio

Professional 3D advice, techniques and tutorials

48 Step by step: Render a dinosaur in Blender
CG Cookie's Jonathan Williamson concludes his series



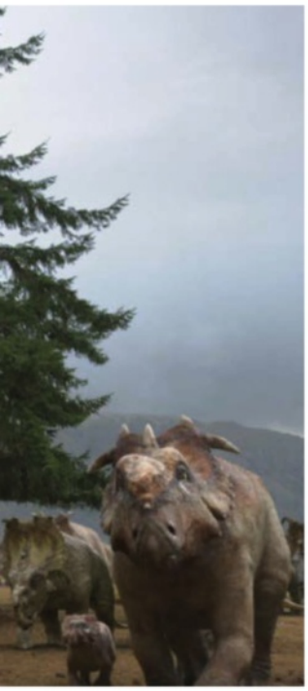
54 I Made This: *Bear King*
Anders Ehrenborg busts out from the world of cartoon work with this photorealistic piece

56 Step by step: Mesh shatter your characters
Create unique character renders with Christopher Velez

64 I Made This: *Render Curves*
When it comes to Arnold, Lee Griggs is the man in the know, as showcased by this fantastic work

66 Step by step: Shatter a moving character
Anselm von Seherr-Thoss reveals his simulation workflow

91 I Made This: *Ouverture*
Michael Feuerroth demonstrates once again how powerful a tool Marvelous Designer really is



The workshop

Expert tuition to improve your skills

74 Masterclass: The MODO to NUKE pipeline
Composite CG with real-world footage using pro industry tools

78 Back to basics: Rig a steam locomotive in Maya
Jahirul Amin prepares his train asset for animation

82 Questions & Answers
This section is for users who have some experience of 3D and want to learn more

3ds Max: Rigging
MODO: Replicators
ZBrush: Rendering skin
3ds Max: Shader techniques

workspace

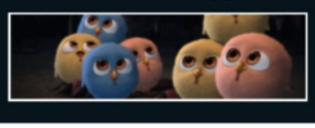
Industry news, career advice & more

102 Industry news
Get up-to-speed with industry events

104 Studio Access: Reel FX
From working out of the garage to the silver screen

108 Project Focus: Axis Animation
The up-and-coming studio discusses *Fable Legends*

110 Industry Insider: Fausto De Martini
The game and movie artist reveals his artistic approach



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Turn to page 112 for the complete list of the disc's contents

WELCOME TO THE GALLERY

Seven pages of great artwork from the 3D community

Images we love!

We love how this image reminds us of the spooky ghost photographs we looked at when we were young. The atmosphere is greatly aided by the bright daylight seeping into the room through the windows

Chris Deputy Editor

Artist info

Andy Walsh

3DArtist online

Username: stayinwonderland

Personal portfolio site
www.stayinwonderland.com

Country UK

Software used 3ds Max, V-Ray, Photoshop

Work in progress...

I love how 3D environments can interact with photography. Here I wanted to use some stock photography that fit the lighting of the scene, and then work to seamlessly bring the two together

Andy Walsh, *Corridor,* 2013

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“It’s impressive to learn that this dreamy image, based on Ian McQue’s work, is from a student project. Moran recreated the illustration in 3D in just two short weeks”

Larissa Staff Writer

Artist info

Moran Tennenbaum

A 2D turned 3D artist, Moran specialises in environments, props and characters

Personal portfolio site
www.morantenn.com

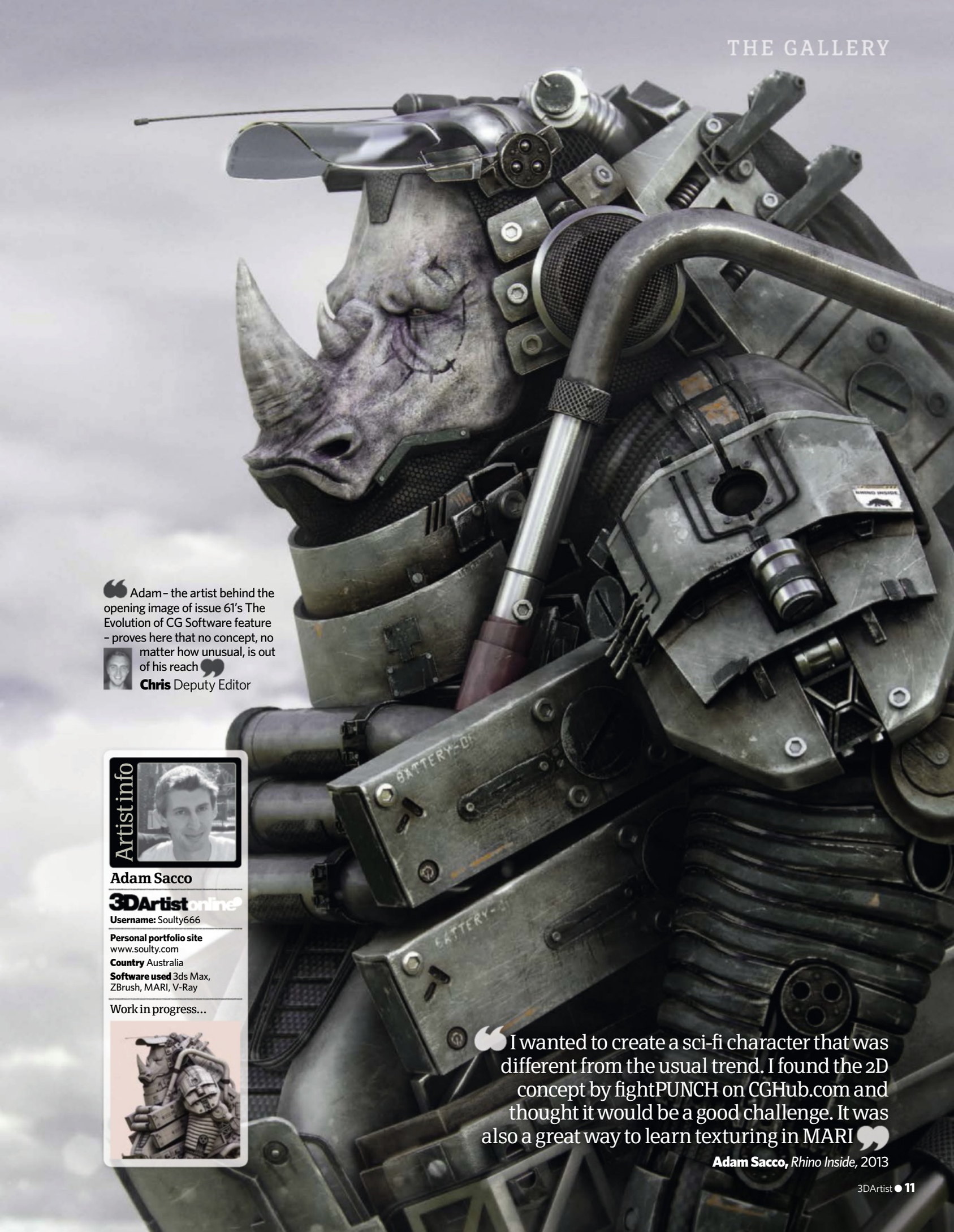
Country USA

Software used Maya, ZBrush, Photoshop, Mudbox, xNormal, V-Ray, NUKE

Work in progress...

“This project was created as part of the Demo Reel class at Gnomon. The design and intricate details presented a welcome challenge in terms of modelling and textures”

Moran Tennenbaum, *Waldo,* 2013



Adam – the artist behind the opening image of issue 61's The Evolution of CG Software feature – proves here that no concept, no matter how unusual, is out of his reach

Chris Deputy Editor

Adam Sacco

3DArtist online

Username: Soulty666

Personal portfolio site
www.soulty.com

Country Australia

Software used 3ds Max, ZBrush, MARI, V-Ray

Work in progress...

I wanted to create a sci-fi character that was different from the usual trend. I found the 2D concept by fightPUNCH on CGHub.com and thought it would be a good challenge. It was also a great way to learn texturing in MARI

Adam Sacco, *Rhino Inside*, 2013

Artist info

Pawel Rebisz

Pawel is a web designer and digital artist living in Poland who specialises in characters

Personal portfolio site
www.be.net/estratura

Country Poland

Software used 3ds Max, V-Ray, ZBrush, Photoshop

Work in progress...

"There's a lot of subtlety here. Elements such as the lighting from the paraffin lamp – which Łukasiewicz invented – add a meaningful sense of depth and insight into the life of the Polish pioneer"

Larissa Staff Writer

“AVHY represents my first steps in 3D modelling. I really like the end result, as it's a reminder that I did not study CG professionally, but only using perseverance, dedication and tutorials!”

Alvaro De La Cruz-Melo, *AVHY*, 2013

Artist info

Alvaro De la Cruz-Melo

3DArtist online

Username: Adelacruzmelo

Personal portfolio site www.behance.net/adelacruzmelo

Country Peru

Software used ZBrush, Photoshop, NUKE

Work in progress...

“This might be a simple character, featuring smooth lines and shapes, but it's nevertheless impressive for an artist who started his modelling career less than a year ago”

Chris Deputy Editor

This inspiring building concept is an amazing example of inventive design. It looks like it would be very much at home within a futuristic cityscape

Larissa Staff Writer

Artist info

Maxim Goudin

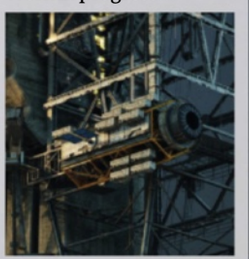
Originally from Crimea, Maxim now lives and works in Moscow as a CG designer

Personal portfolio site
www.behance.net/melkhiah

Country Russia

Software used 3ds Max, After Effects

Work in progress...



This is a kind of speed architecture study. I gave myself two days on each piece and tried not to repeat the style and mood

Maxim Goudin, *Red Sun, Black Sand,* 2013

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The Structure Sensor scans can be exported as OBJ, STL, and PLY files for computer graphics software or 3D printing

Ten of the best new 3D tech developments

We look back on ten of the most exciting new developments in computer graphics this year

- Oculus Rift
- Peachy Printer
- Leap Motion
- 3D Prosthetic Hand
- 3-Sweep
- Structure Sensor
- Jointonation
- Super hi-res 3D Scanning method
- EMY- Full-Body Exoskeleton
- zSpace: Transforming Ordinary PCs Into Powerful Holographic Workstations

Considering the multitude of technologies and published papers introduced at this year's SIGGRAPH and SIGGRAPH ASIA alone, 2013 has been a very exciting time for the CG industry. A new focus on real time – with LightWave's NevronMotion, Faceware Technologies' Faceware Live or Derivative's TouchDesigner all being released – promises to enhance the efficiency of the post-production process as well as gain new footing in areas like video-jockeying and projection mapping. Meanwhile, advances in virtual reality and 3D printing have made the technologies cheaper, yet more advanced. Recently, even supermarkets like ASDA have even started to offer 3D printing services.

As such, 3D Artist decided to look back on ten of the most exciting new hardware and software developments from the computer graphics industry over the year, and consider where these technologies might guide us in the future.

- **Oculus Rift** From humble beginnings in founder Palmer Luckey's parent's garage, the Oculus Rift was designed to be the world's best virtual reality headset, created specifically for highly immersive gaming. Showcased at SIGGRAPH this summer, Oculus VR has since shipped 35,000 developer kits of the headset. "We're working on a lot of ways to improve the overall experience: higher-resolution displays, lower latency, positional tracking and a few things we cannot talk about yet. Our goal is to deliver the ultimate VR platform and bring virtual reality to the mainstream," says Luckey.
- **Peachy Printer** The first 3D printer and scanner for less than $100 (£62), Peachy Printer was initially launched on Kickstarter and Indiegogo by inventor Rylan Grayston. The project ended up achieving its Kickstarter funding goal in just over 24 hours. The tiny 3D printer and scanner promises an almost unlimited print volume and an extremely inexpensive resin as printing material.
- **Leap Motion** Released through online stores such as Amazon earlier this year, the Leap Motion Controller is a USB peripheral that enables users to interact with their computers using their hands as opposed to a mouse. For 3D artists, it means the sculpting models using your hands with up to 1/100th of a millimetre of accuracy. It currently retails at $79.99.
- **3D Prosthetic Hand** Another crowd-funded campaign, the open-source Open Hand Project with its 'Dextrus Hand' is an advanced robotic hand built using 3D printed plastic parts. These can be easily replaced to modify the hand dependent on the user. The ultimate aim is for the hands to be sold for under $1,000.
- **3-Sweep** Submitted to SIGGRAPH Asia this year was 3-Sweep, an interactive modelling technique that allows users to quickly create editable 3D shapes by extracting them from a normal photograph. The YouTube video of the technique went

viral when it was uploaded in August, and has generated 1.6 million views. The main developer of the method is postdoctoral researcher at the Columbia University, Tao Chen. "Our goal is to let novice users generate simple 3D models from an image, and let professional users do it in a more efficient way," he says. "The 3-Sweep could become a plug-in on 3D modelling software such as Autodesk 3ds Max and Google SketchUp, to help designers generate 3D models or parts of models from images."

- **Structure Sensor** The world's first 3D sensor for mobile devices, Occipital's crowd-funded Structure Sensor gives users the ability to capture 3D maps of indoor spaces on their iPad, including 3D models of objects and people. It also introduced the ability for mobile applications to be developed with it in mind, introducing the possibility of augmented reality games where CG objects interact with the geometry of the physical world.
- **Jointonation** The initial inspiration behind Jointonation, which was submitted to SIGGRAPH Asia this year, was to be able to become the heroes of movies, videogames and comics through not only virtual reality visuals, but creaking joints, sound effects and vibrotactile feedback too. "The hardware setup is actually quite simple. Four vibrotactile transducers were attached on the user's elbows and knees. We capture the user's joint angular velocity with the Kinect motion tracking camera, and then actuate those transducers to provide robot-like joint senses," explains masters student and developer of the project Yosuke Kurihara. " Using a head-mounted display such as the Oculus Rift, the user also sees his or her own body as a 3D robot model in a virtual Hong Kong city, and hears creaking sound effects."
- **Super hi-res 3D scanning method** Using two commercially available cameras and a projector, Dutch researcher Tim Zaman designed a method to capture 3D images of fine art paintings for his thesis earlier this year. It allowed him to capture large areas of topography, as well as hi-res colour and depth information. Zaman managed to use the technology to result in an incredible 40 million points captured in 3D space and in full colour per each capture of paintings by Van Gogh and Rembrandt. The result was a complete scan of each painting, from brushstroke length and type to the shape of each build-up of paint and texture on the canvas. The scans were then 3D-printed to result in perfect technical reproductions of the original brushstrokes.
- **EMY- Full-Body Exoskeleton** Developed by the interactive robotics unit of CEA LIST, based in Paris, EMY (Enhancing MobilitY) is a full-body exoskeleton designed to help quadriplegic people walk again. Previewed at this year's SIGGRAPH, the robot is the fruit of ten years of research from a team of 20, featuring four limbs that will be controlled via a brain-computer interface called WIMAGINE. A five-centimetre brain implant, WIMAGINE records and broadcasts electric activity, allowing the user to control EMY at different levels of complexity, from simple joint movements to abstract tasks coordinating the use of several limbs. As of 2014, the interface will also be capable of keeping the machine properly balanced.
- **zSpace: Transforming Ordinary PCs Into Powerful Holographic Workstations** An interactive hardware and software platform, zSpace lets developers and users interact in a 3D holograph-like environment, where objects appear to be in open space with full colour and high resolution. Users can directly interact with the virtual holographic objects using a 3D display, specialised stylus and polarised 3D eyewear. It even allows the user's head to be tracked so that the image on screen is adjusted according to the angle you view it from.

> "We're working on a lot of ways to improve the overall experience: higher resolution displays, lower latency, positional tracking, and a few things we cannot talk about yet"
> **Palmer Luckey**, founder of Oculus VR

Above Only five people were involved in working on 3-Sweep. "We'd like to continue the development of 3-Sweep. Currently it is still a research prototype, but we'd like to make it more robust for release," says Chen

Left The team is now working on re-creating elements of paintings that the high-resolution scans and 3D printing method was unable to reproduce, like exact levels of glossiness and transparency

The Oculus Rift team has been testing new ways to deliver a more exciting VR experience, such as using simulations to give the sensation that the player is a superhero, capable of controlling water or wind

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From the slovenly sloths of the Amazon rainforest to the predatory polar bears of the Arctic Circle, World Of Animals is a new monthly magazine from the makers of How It Works and All About History, taking a unique look at wonderful wildlife from all over the globe.

With detailed photography, stories and illustrations each issue offers the safari of a lifetime, while also coming in incredibly useful as reference material for research into both the aesthetics and biology of wildlife for 3D projects. Readers are taken on a fact-filled tour of the planet's wildlife, exploring the habitats, behaviour and societies of all Earth's creatures, great and small.

On sale now, the first issue includes an in-depth look into the world of gorillas, an exposé of 50 animals dangerously close to extinction and what can be done to save them, plus a bite-by-bite account of how great white sharks hunt down their prey.

This groundbreaking magazine launches alongside digital editions for iOS and Android, available from greatdigitalmags.com, and is accompanied by a brand-new companion website: animalanswers.co.uk. Be sure to connect on Twitter @WorldAnimalsMag and Facebook at facebook.com/worldofanimalsmag, and let them know what you'd love to see in forthcoming issues.

World Of Animals is on sale now.

CG Portfolio – Elberfeld Kreation

Jan Kristian Vollmer, head of 3D at Elberfeld Kreation, explains the techniques behind creating hyper-real interior designs with Eiermann Office Interior

My inspiration behind creating these images originates from my desire to portray photorealistic dimensions while creating a certain atmosphere. When working on these images, global illumination happened to be the most challenging aspect, since atmosphere and ambience all depend on the light settings and how they are used.

1. LIGHT

The technique I recommend using when creating the lighting is to use V-Ray for rendering. First, I set a panoramic picture of the Sydney skyline around the room that I was going to create. The light should result as though its from this sphere. To arrange natural-looking light inside the room, my tip is to use V-Ray plain lights and direct lights in front of the window. Plain lights create a bluish touch as though they are coming from the sky, and direct lights create yellowish light, imitating sunlight.

2. FLOOR

To achieve the various dark and bright reflections on the floor, I have used a texture within 3ds Max 2012. Out of the many options in the software, I chose a texture to make dark spots reflect brightly, while bright parts stay as they are.

3. FITTINGS

Another strong element is the arrangement of furniture and decorative elements. To find the ideal composition I just try out different fittings. Also, I compare my work to other artworks that provide me with inspiration. Last but not least, I am able to add details and make changes any time that I wish. This is what makes the biggest difference when using CG as compared to using conventional photography. All in all I am satisfied with the result of the final images.

For Vollmer, the most rewarding aspect of creating in CG is the ability to balance perfection with alterations in post – something photography cannot afford

Vollmer created the images using 3ds Max, V-Ray and Photoshop

3D Artist FirePro Fridays

WIN SAPPHIRE AMD FIREPRO CARDS WORTH $5,500!

Every Friday in the run up to Christmas

If you've been following 3D Artist on Facebook (www.facebook.com/3DArtistMagazine) then you'll have noticed we recently smashed through the 100,000 likes mark. In celebration of this fantastic achievement, we decided to launch FirePro Fridays over the course of December!

Thanks to our partnership with AMD and SAPPHIRE, we'll be offering four powerful graphics cards exclusively to 3D Artist readers every Friday in December. On 6 December, 13 December, 20 December and 27 December, we will be giving away a range of cards, from the FirePro W5000 right through to the W9000!

All you need do is answer a simple question each Friday to be in with a chance of winning a card, with the winners announced every following Thursday.

Be sure to keep an eye out for new giveaways on the following dates! The cards will be announced via Facebook (www.facebook.com/3DArtistMagazine) and Twitter (www.twitter.com/3dartist), so follow us now if you don't want to miss your chance to win these powerful SAPPHIRE AMD graphics cards!

A huge thanks go our to our partners AMD and SAPPHIRE for arranging this fantastic giveaway!

AMD

SAPPHIRE

ABOUT AMD

AMD is an innovative technology company, dedicated to designing and integrating technology that powers millions of intelligent devices. These span everything from personal computers, tablets, games consoles and cloud servers that define the new era of surround computing. If you're using new technology, there's a big chance AMD is involved.

ABOUT SAPPHIRE TECHNOLOGY

SAPPHIRE Technology was first formed as a manufacturer and global supplier of graphics cards when ATI (now a division of AMD) adopted the Add-in Board partner model for delivering its technology to market. This year, SAPPHIRE celebrates ten years of trading, bringing its successful mix of innovation and customer satisfaction to the global graphics market.

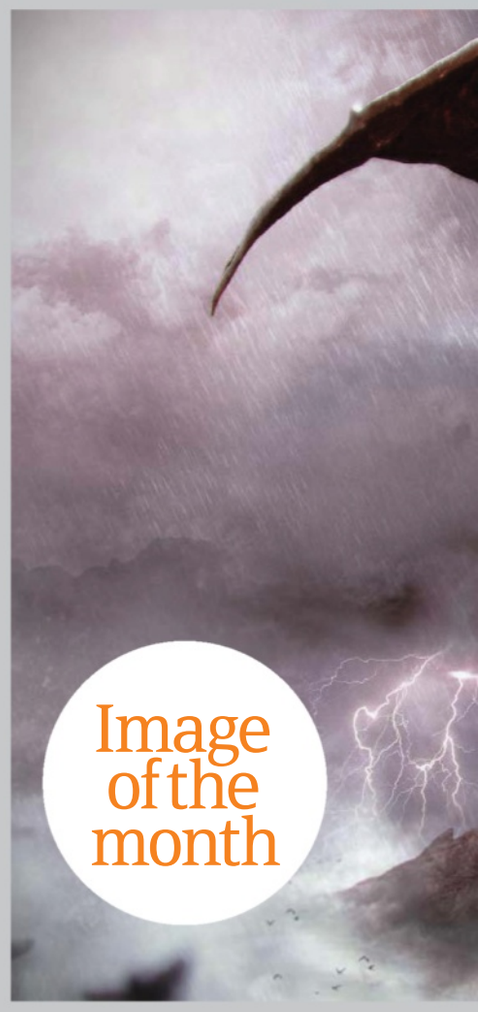
ABOUT FIREPRO

Designed, built and thoroughly tested by AMD, professionals in the CG industry can rely on the power of AMD FirePro professional GPUs for the demanding and processor-intensive workflows. The desktop W series is based on the Graphics Core Next GPU architecture and is designed to efficiently balance all levels of 3D workloads. These cards are optimised and certified for leading workstation applications, and ensure ultra-high geometry performance and smooth handling of complex models. New levels of performance make these cards a prime choice for compute-intense applications.

*All prices taken from http://shop.amd.com/uk on 14 November 2013

You can learn more about the **SAPPHIRE AMD FirePro W5000, W7000, W8000** and **W9000** at **www.tinyurl.com/3DAFireProFridayCards,** all of which are being given away between **6 December 2013** and **27 December 2013** via **3DArtistOnline.com**

TERMS AND CONDITIONS: Imagine Publishing and its partners have the right to substitute the prize for a similar item of equal or higher value. Employees of Imagine Publishing, AMD, SAPPHIRE Technology, their relatives or any agents are not eligible to enter. The editor's decision is final and no correspondence will be entered into. Prizes cannot be exchanged for cash. From time to time, Imagine Publishing or its agents may send you related material or special offers. All entrants agree to participate in any promotion related to this competition. The first entry date for the competition closes on 6 December 2013, and the final competition date on the 27 December.



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www.3dartistonline.com
to view the art and chat to the artists

Images of the month

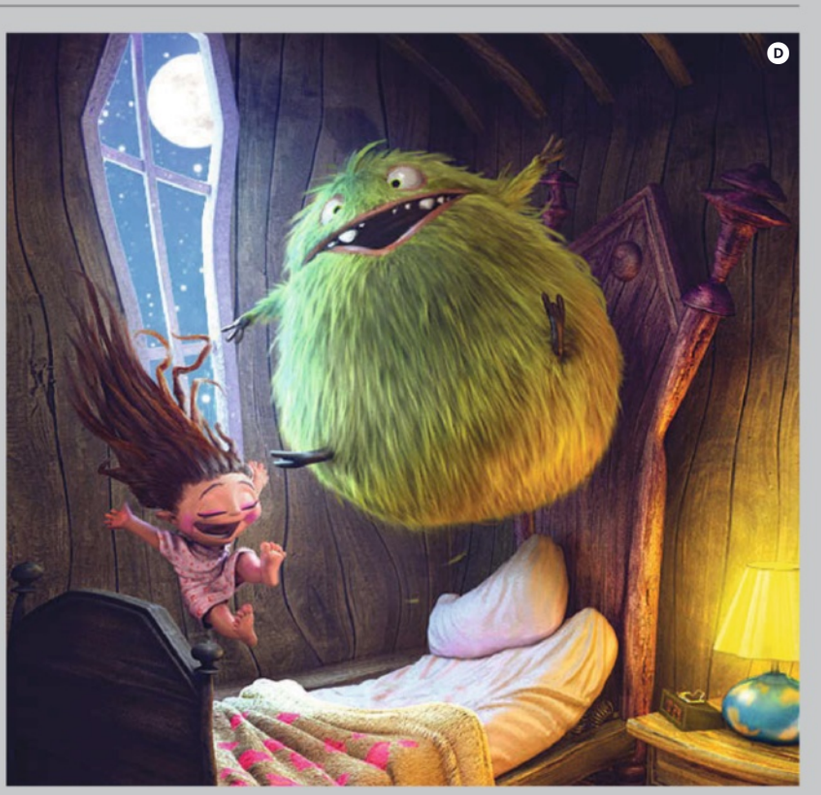
These are the illustrations that have been awarded 'Image of the week' on 3DArtistOnline.com in the last month

A Planetarian Engineer
» David Mattock
3DA username mattock
David says: "This image was completed after taking the CGSociety hard-surface-modelling course. We had to base it on artwork from a professional 2D concept artist. I was supplied one I loved by Adrian Majkrzak."
We say: *We love the use of lighting in this image and the JJ Abrams-esque lens flares! This piece also incorporates much of the advice from our sci-fi feature this issue. You get the feeling that this character has a sense of purpose, thanks to his environment, pouches and circular saw.*

B Bulby
» Jefferson Wall
3DA username zephyrchef
Jefferson says: "This image was inspired by the film *The City of Lost Children*. It was created in 3ds Max with a tickle of ZBrush and a side order of Photoshop. In it, an enthusiastic scientist goes to rather extraordinary lengths to ensure the cultivation of brighter ideas."
We say: *It's Pixar meets Jean-Pierre Jeune, with a pinch of Terry Gilliam! The character here really captured our imagination: an old inventor perhaps searching for ways to boost his fading brain power?*

C The Binding
» James Suret
3DA username zerojs
James says: "Originally this was a character design, but I turned it into an illustration by adding scenery and details to tell a story about a demonic creature on an epic scale."
We say: *It's the details that really sell the imposing nature of this image. The mages are all but dwarfed by the creature, which reaches high above even the strikes of lightning and is chained to the very mountains. Epic stuff!*

D Slumber Party
» Aamir
3DA username Aamir
Aamir says: "The original artwork for this image is by Marco Bucci. I worked on the modelling, texturing, lighting, rendering and look development. I created it because it's a lovely, emotional and appealing piece."
We say: *This is a wonderful image that perfectly captures the joy and imagination of childhood. Technically it's an impressive piece too – the hair on the creature is particularly eye-catching and the warm, soft glow of the lamp helps impart a welcome sense of atmosphere.*



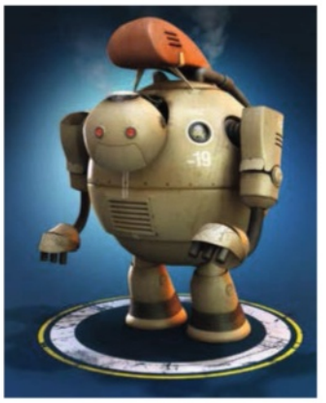
Qunari

» **Morten Frølich Jæger**

3DA username MjTheHunter

Morten says: "I thought it would be interesting to mix a face study with a fantasy design, so I decided to base my sculpt on a Qunari from the videogame *Dragon Age*."

We say: *We're big fans of* Dragon Age, *so our eyes were immediately drawn to this Qunari-inspired character. The face itself is strong and robust, perfectly straddling reality and fantasy.*



Worker Robot

» **Hossein Afzali**

3DA username Rysh

Hossein says: "Ever since childhood I've been crazy about robots. I've always wanted to have a kind one that could to do my chores for me!"

We say: *How can you not enjoy this little guy? The use of simple shapes and forms to build this podgy little automaton makes for an incredibly endearing and easy-to-like character.*

Judith Statue

» **Zuzanna Kucharska**

3DA username Zuzanna Kucharska

Zuzanna says: "My main objective was to produce a realistic statue in a natural environment. My approach was a new interpretation of a famous classical theme: Judith beheading Holofernes. I used Mudbox for sculpting, posing and painting textures, then Maya and mental ray to set up the scene and final render."

We say: *Great use of materials in this image to create the feel of photorealistic marble. The lighting feels like it matches the chosen background perfectly.*

Weirdo

» **Zhang Yongqiang**

3DA username Yongqiang Zhang

Zhang says: "This is my latest work; a weirdo concept design. It was modelled in ZBrush, textured in Photoshop with render passes in ZBrush. Final post-production was completed in Photoshop."

We say: *We love a mean-looking creature sculpt, and this one delivers. The emotion is skilfully imparted using the eyes and mouth.*

Have your say

Email, Tweet or get in touch with us on Facebook to share your thoughts, opinions and proudest projects

Top tweets

Get involved... @3DArtist

@Tom_Schlegel My first issue of @3DArtist finally arrived today! :) #AmazingFriday

@DaKangaroo Once 3D printers are cheap, mass-produced and can use multiple materials and paint finishes, I'm only leaving the house for refills.

@3DArtist Nicolas Delille has posted a closer look at the ladybug image we posted last week. Some incredible detail here!

@mvanas1050 Sigh! Awesome work. With my old eyes and hands, I can only dream!

On the Wall

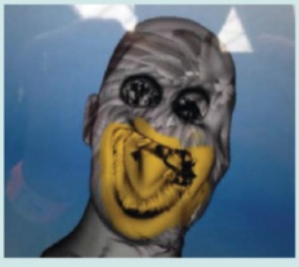
Facebook.com/3DArtistMagazine

This is our attempt at sculpting a face using the 123D Sculpt app at the 3D Print Show. Warning: it's terrifying

Sean McQuillan Such polygons. Many smiles. Such realism. Wow

Casey Addler Ship it!

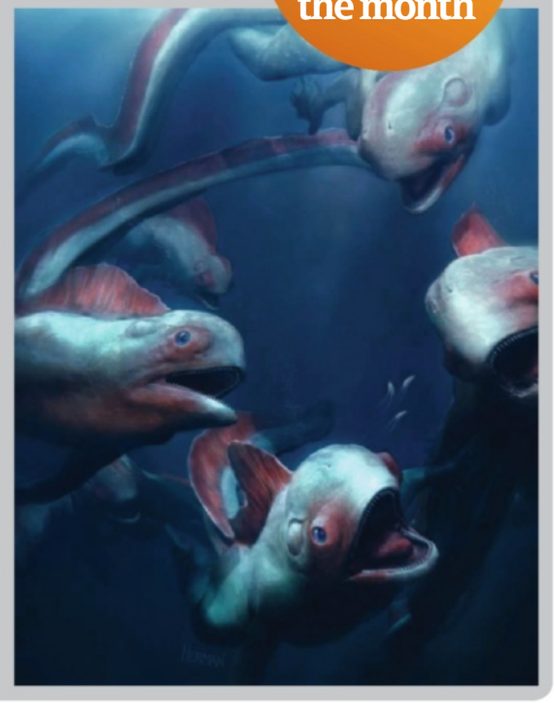
Gregor Middendorf Ay caramba!



If you want to have your work or thoughts displayed here, get in touch with us via email at **3dartist@imagine-publishing.co.uk**, via Facebook at **facebook.com/3DArtistMagazine** or on Twitter **@3DArtist**

Social media images of the month

Dragon Render **Facebook likes** 1,145
» **Steven Lord**
We say: "We've been big fans of this image from Steven for some time now, and clearly the 3D Artist community is too. As we've come to expect from Steven, the ZBrush work is fantastic, but it's details such as the light emanating from the creature's mouth that really draw you in."



Red Skinned Slarks **Facebook likes** 1,443
» **Josh Herman**
Josh says: "I created this image using ZBrush to sculpt the creatures and Photoshop to finish and render the final illustration. They were made for a new book by Ballistic Publishing called *Essence: Creatures*, which examines the process behind each of the pieces in the book."

Low-spec software

I've been buying your magazine for some time now. I used to pick up a lot of tutorials and tips in the early copies of 3D Artist, but I have realised lately that there are fewer tutorials and tips on low-spec applications. 3D Artist seems to be marketed at people who aspire to be professional graphic artists and use expensive software like 3ds Max or ZBrush. Where is the hobbyist satisfied? Maybe there is a market for a magazine for the hobbyist who uses low-spec software? I'd buy that!

Michael Joyce, via email

Hi Michael,
Sorry you're not happy with the mag! We do our best to cover as wide a selection of software each issue, hopefully including enough of a variety to please users of all levels and abilities. Our current content is based on a reader survey, which revealed to us the software our readers were most interested in learning about at the time. We will be launching a new reader survey soon, where you will once again get to make your voice heard. However, in the meantime we will continue to endeavour to get the tools and software in the mag that you most want to hear about.

YOUR TOP WALL POSTS

Billo Rani
» **Sharjeel Zafar**
3DA username Sharjeel Zafar
Sharjeel says: "Qingqi (pronounced 'ching-chee") is a new form of transport in Pakistan, which is a cross between a motorcycle and auto-rickshaw. It runs just like a motorcycle but comes with three wheels instead of two and carries a much heavier load."

Kitchen Interior
» **Mark Lester Ocampo • 3DA username** kewl1291
Mark says: "This is part of a larger set of kitchen renders I did for our company's advertisement. We decided to use CG and used SketchUp, 3ds Max, V-Ray and Photoshop. The realism is very convincing."

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MASTER THE ART OF SCI-FI CG

Sci-fi has never been more popular. Here, industry experts give us their top 50 tips for designing futuristic robots, aliens, environments, props and vehicles that are light years ahead of the rest

There's are few realms of design that offer the breath and scope of creativity as that found in the world of science fiction. Whether it's for games or for film, whether it's robots or aliens or even exhaust pipes protruding from the back of an M-class starfighter, whatever you're tasked with, the possibilities of an imagined futuristic world are near limitless. But while the sheer vision and spectacle of sci-fi design can be exhilarating, it can also be intimidating. So, here we've tracked down some of the world's top sci-fi artists to have them explain their processes. Over the next few pages, we speak with contributors to such projects as *Elysium*, *Halo*, *Star Wars*, *Iron Man*, *Pacific Rim*, *Star Trek: Into Darkness* and more to discover just how they take the mundane and everyday, and turn it into something truly out of this world...

EXPERTS

Daniil Alikov
Texture artist
Expertise Texturing, UVing and look development
www.alikov.info

Jason Godbey
3D artist
Expertise Environments, lighting and architectural visualisation
www.jg-art.com

Ben Mauro
Senior art director at FZD
Expertise Production design for the movie business
www.artofben.com

Kurt Papstein
Film & games 3D artist
Expertise Concept and character design, digital sculpting
www.ikameka.blogspot.co.uk

José Daniel Cabrera Peña
2D concept artist
Expertise Sci-fi, historical and fantasy
www.joscabrera.blogspot.co.uk

Paul Pepera
3D modeller/designer
Expertise Hard-surface modelling, concept design for games
www.peperaart.com

Stefano Tsai
Games 3D concept design
Expertise Mechanical assets and game environments
www.stefanotsai.idv.tw

Colie Wertz
Concept & prop designer
Expertise Concepting, hard surface design and modelling
www.coliewertz.com

Fausto De Martini

Freelance digital designer and illustrator

On the creation of Deployment Unit

"I started with the human body model that comes with ZBrush, and defined the overall volume of the suit using the Clay Buildup brush. I then spent time painting mechanical looking alphas to get complex surface details. I painted sub groups so I could export the mesh in different parts, which allowed me to apply shaders in specific areas. I then moved into 3ds Max and modelled parts that fit on top of the armour, adding elements like the shoulder straps. I also used some kitbash techniques, adding smaller shapes from my library. I incorporated some cloth elements on the joints using Marvelous Designer. I used V-Ray to add textures to the model, while most of the scratches and weathering were added in Photoshop in post."

ROBOTS

01 Sketched silhouette "Use 3D tools as sketch brushes to help figuring out the basic silhouette and the negative space of your image. Don't put too much detail into the geometries, instead keep it as simple as possible. If it doesn't look interesting enough at that stage, don't even bother to bring it to next level." **Stefano Tsai**

02 Get moving **"Thinking about how your robot moves will help you plan out its basic shapes and forms. After all, they all need to go on their missions, and what they look like in motion is as important as stationary. It's like car design; the car body's lines will make it look more speedy or more luxurious, depending on what you're after." Stefano Tsai**

03 Form equals function "It must be very clear in the beginning what the main purpose of your robot is. It can have a few, but viewers need to know the primary one. The design needs a focal point too, otherwise the result will be a jumble. You wouldn't put a sports car and a digger together in one design." **Stefano Tsai**

04 Get grounded "To make a high-concept robot feel real, you can use real-world materials to ground it. So add materials, decals and colours that surround us; ones the viewer can recognise and be familiar with. For example, you can take something like a contemporary aeroplane rescue access design and fix it onto your futuristic design." **Stefano Tsai**

05 Pick an era "One way to bring your robot to life is to pick a suitable era of technology and use details from that across your design. If you built a car chassis and you needed to fix good components onto it, you couldn't shop from different time periods. So, imagine your creation is pieced together from technology of the day." **Stefano Tsai**

06 Believable mechanics "No matter how advanced your robots are, they'll need mechanical parts to make them move. Their structure needs to support that. For instance, the lower torso usually has two leg joints, so the equipment beneath should be a power source, or structural support for the legs." **Stefano Tsai**

07 Personalise them "We've all seen so many sci-fi robots that it's easy to sleepwalk into designing something similar. So, make sure you add something that is all your own. In the large image on the right I added a spine on the back of the robot, the little arms like an insect's below its belly and some heavy duty legs." **Stefano Tsai**

08 Less is more "When it comes to robot design, it's very easy to add too many mechanical details and ruin the whole image. This isn't to your benefit. If you want to add emphasis to certain details, the area surrounding them needs to be much simpler. Don't be afraid of empty space, because your viewers' eyes need to have some place to rest." **Stefano Tsai**

09 Play up the differences "Emphasising the different materials in your designs will help to add more believability to your work. Paying attention to what materials you are rendering and accurately portraying them is very important to adding another level of realism to your final image." **Ben Mauro**

10 Go the other way "A lot of robots are based on looking at and mimicking real-world robotics, so one way to stand out would be going in the opposite direction and making something completely organic. Looking to nature and other odd sources of inspiration will help make your designs unique." **Ben Mauro**

ALIENS

11 Beyond the sea "Coming up with an alien race is such a big task that it can seem overwhelming. A great place to start is studying insects and ocean life, as you can find particularly extreme evolutionary traits. You can then project how that creature might evolve into a dominant species." **Kurt Papstein**

12 What's the motivation? "Just as you would if designing a human character, think hard about the alien's backstory and motivation. From there you can think about how its society would function, and making this seem real will make your little ET stand out." **Kurt Papstein**

13 Get the basics right "ZBrush is a great way to build your designs, as you can use basic primitives to quickly block in a base mesh, whether that might be biped or quadruped. Once the basics are in place, you can use layers and sculpting brushes to distort the shapes from all angles to find an interesting silhouette." **Kurt Papstein**

14 Anatomical finesse "Sometimes a character will look like it is made up of many different creatures. It's your job to find those creatures through reference and research. Sculpt each piece and then combine them, ensuring a flawless anatomical structure." **Kurt Papstein**

15 The eyes have it "Forward-facing, soulful eyes give your audience something to connect with and make the alien look more intelligent. Side-facing or insect eyes make them seem more animalistic." **Kurt Papstein**

Seeing how the robot will look in action can really help define your design

16 A mouth to feed **"After the eyes, the next feature that helps us identify with an alien is its mouth. It also gives us some idea about its daily life. Does it communicate verbally? Does it chew and swallow food? The mouth can push the idea of it being more brutal and animal-like, or gives us somewhere different to read expression from." Kurt Papstein**

17 Texture time "Skin, bone, fur or scales – there are a lot of texture options when it comes to aliens, and of course, the surface treatment of your alien can vary. It's a fun area to explore and get graphic with vibrant colours and patterns, but remember to follow those rules of nature to make your character clear and coherent." **Kurt Papstein**

18 Cover up "Costumes can help to tell more of your alien's story. More technically advanced suits and mechanical design indicate a lot of intelligence, while something simple like a loin

"Always think about the story – it's the most important aspect when dealing with every part of the design," says Papstein

Combining human and animal poses can help you get your alien just right

cloth will indicate a simple lifestyle on a distant planet. Just remember to make it feel a little foreign to Earth's fashion sense…but then again it could be really cool to see what an alien renaissance would look like!" **Kurt Papstein**

19 Body language "How your alien is posed in the end says a lot about its intentions, motivation and personality. If it is standing upright with its chest puffed out, a wide stance and its head held high, it can be a heroic and noble pose. If the alien is slouched over and has its arms curled and a snarl on its face, then the audience knows they need to be careful." **Kurt Papstein**

20 Presentation is key "When it comes to lighting your alien, it's important to keep his story and culture in mind. Are they technologically advanced? Maybe some blue lighting from the top or underneath will give the illusion of computer screens illuminating the face. Perhaps something really dark with contrasting bright spotlight will help it feel more menacing and monstrous." **Kurt Papstein**

ANDROID MASTERCLASS

"For this android image, I really wanted to give it a sense of story and history that would help draw the viewer in and keep them looking and thinking for a long time. Playing with visual contrasts is always a good place to start, so in this case I decided that an old man modified with all this advanced technology would be a really interesting starting point for creating a design (old/new, dirty/clean, high-tech/low-tech). On top of that I added some interesting tattoos and other ports, scars and details which help define this character, the life he has lived and the world he has lived in. If your image feels too clean, you can add texture and ageing to an image by throwing a photo texture of rust, dirty metal, old paper etc over the top on a soft light layer to let a lot of really high intensity detail come through. If it feels too intense, lower the opacity and erase some areas." **Ben Mauro**

50 Sci-Fi Tips & Tricks

FIVE NEW LAWS OF ROBOTICS

Sci-fi artist Daniil Alikov demonstrates why, for him, design is far from a closed process

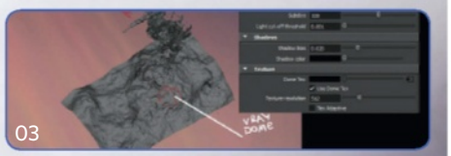
01 **Follow up on every idea** You never know what that weird thought can turn into once you start seriously working on it. You can always forget about it if it doesn't work.

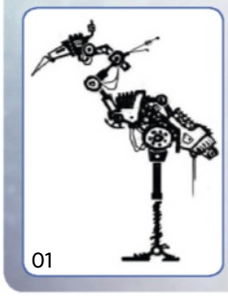
02 **Reality and functionality** When creating solid, convincing robots, it's helpful to use existing parts from real machines, as they usually have a more complex shape and structure than what you can invent on the fly. Try to add a touch of visual functionality to your model, too.

03 **Light your scene** Spend a lot of time on this, because it gives your image a distinctive look and makes it memorable. And don't be afraid to lose any details you have modelled and textured; sometimes they have to be sacrificed for good composition, lighting and angle of view.

04 **Composite carefully** Spend some time learning compositing software, so you can do more than just render passes together. A cinematic look can turn your robot into a much more believable thing, especially if you work with 32bit images.

05 **Remake and redo** Aim not just for a good result but for the best. Judge every part of the robot for usability, beauty, design and plausibility. And of course, don't forget to watch how everything works together. If one element spoils another, just delete it and replace it with something better. Show yourself no mercy! Only the best result matters.





Even if the main part of your project is a spacecraft, it's still important to think about the background and environment. A stunning backdrop can really help support the idea and story that you are trying to sell

ENVIRONMENTS

21 **Read your shapes** "When putting a scene together, it helps to zoom out and make sure the shapes are readable and that there isn't detail cluttering every part of the scene. When you zoom out, you should be able to see the shapes fairly clearly. This concept applies to textures as well as geometry." **Jason Godbey**

22 **Faking it** "When lighting a scene, don't be afraid to add highlights to areas without a visible light source. Some people would consider this to be cheating, but it works to enhance the composition by leading the eye to specific parts of the scene." **Jason Godbey**

23 **Easy on the 'fi', add more 'sci'** **"Really good sci-fi is not the place for technological delusions but the first step for actual science. It's when we focus on exploring the outer limits of real science that we build authentic sci-fi, which looks more believable and ultimately draws in the viewer more." José Daniel Cabrera Peña**

24 **Warm front advancing** "Simply put, warm colours advance and cool colours recede. So, if you want to draw the eye towards something, you might be better off using a warm light. This is used in interior design too. If they want a room to feel larger they paint it with a cool colour, like blue or green. A room can feel more intimate and smaller by painting it a warm colour, like red or orange." **Jason Godbey**

25 **Leave them wanting more** "Try and include elements that imply that the environment is bigger than what can be seen and therefore encourage the viewer to speculate. This could be just showing the bottom of a staircase or a slightly open door with light streaming through. The sense of unease could be heightened by making this light source red. Not knowing what is around the corner, but knowing something is probably there, builds tension in the scene." **Jason Godbey**

26 **Create a backstory** "Enhance your environments by crafting a story around them. Even if there are no people in the scene you can use objects as characters, adding a sense of narrative through discarded items." **Jason Godbey**

27 **Think about purpose** "Many artists add random, commonplace machine guts, mechanical pieces or simply garbage structures to their work that appear to look real on the surface but have no conceptual purpose at all. This scattering makes too many concepts look the same. What these kind of concepts lack is a real concept design. They can be good visual experiments, but they end up lacking purpose." **José Daniel Cabrera Peña**

28 Become a scientist "In order to get a real concept design started, it's good to keep one eye on the existing science, and the other on the function our fictional science would be intended for. Summarise the needs of your concept, and behave as if it's a real architecture or engineering project for the present, not a game or movie about the future." **José Daniel Cabrera Peña**

29 Colour change "If you need a boost of inspiration, try changing your colour palette any time during the creative process. Sometimes this simple change can give us a new fictional input to work with, feeding our imagination or completing the needs of our concept." **José Daniel Cabrera Peña**

30 Don't go too far "Avoid that state of mind that emerges when creativity is over. If you feel the need to add that hexagonal pattern or the triangulated metal structure that resembles a crane arm, think twice about what you are doing. Go back to what your concept actually needs, and refresh from there." **José Daniel Cabrera Peña**

PROPS

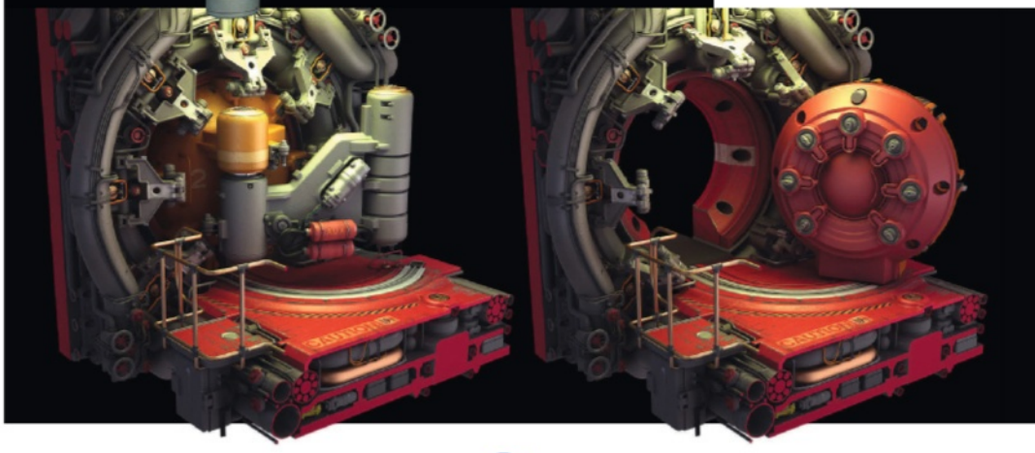
31 Implied functionalism "It is best to avoid details and elements that only serve an ornamental purpose and to put yourself in the mindset of an engineer. Make sure every bit of detail serves a purpose." **Paul Pepera**

32 Points of interest "Even when you're working on smaller props, a harmonious balance of detail and large form is vital. This will give the props a better initial read, which is especially important if the prop is to be placed in a cluttered environment. Like colour or line work, a good ratio of different form sizes can guide a viewer's eye over an object and creates points of interest." **Paul Pepera**

33 Down with diagonals "The random 45° panel cut on a prop is the bane of sci-fi design and should be avoided at all costs. If there is no good reason to put a diagonal panel on something then don't do it. Everything is subservient to implied functionalism and justified accordingly." **Paul Pepera**

34 Don't shy away from the tough stuff "When modelling props, you should go after the hard shapes. Polygonally model in forms and try to intersect or collide meshes as little as possible. Construct things as they would be constructed in real life, as this will give grounding to your modelling work that otherwise could not be achieved." **Paul Pepera**

35 Embrace whimsy "Science fiction, at its core, is about whimsy. However, if you do your job, you can make the implausible seem plausible. Even the craziest idea can work if properly justified by using implied functionalism. A successfully designed sci-fi prop transports the viewer to that world in a single glance." **Paul Pepera**



ABOVE
"This environment has a strong concept background involving world destruction, so it's great at defining its own atmosphere," says Peña

LEFT
If something looks difficult then it probably was, but that's no reason not to give it your best shot, believes Pepera

BELOW
Recurrence of shapes helps tie objects and scenes together, while grounding them in the same design space, according to Pepera

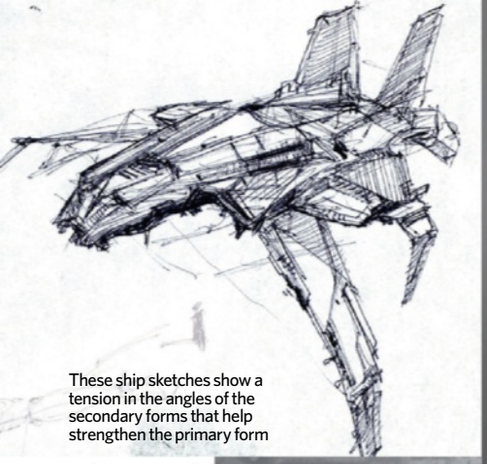
36 Ready to re-use "In the videogames industry, a good metric for determining if a prop design is successful is how reusable it is. Leaving things like scale and spatial orientation ambiguous will allow world builders to use props in many different ways. Apart from saving time, these also offer performance and memory optimisation benefits." **Paul Pepera**

37 Kitbashing for consistency "Kitbashing has various benefits. Yes, it increases your output speed by utilising re-use of props, but more importantly it serves to aesthetically tie a series of works together with a visual theme." **Paul Pepera**

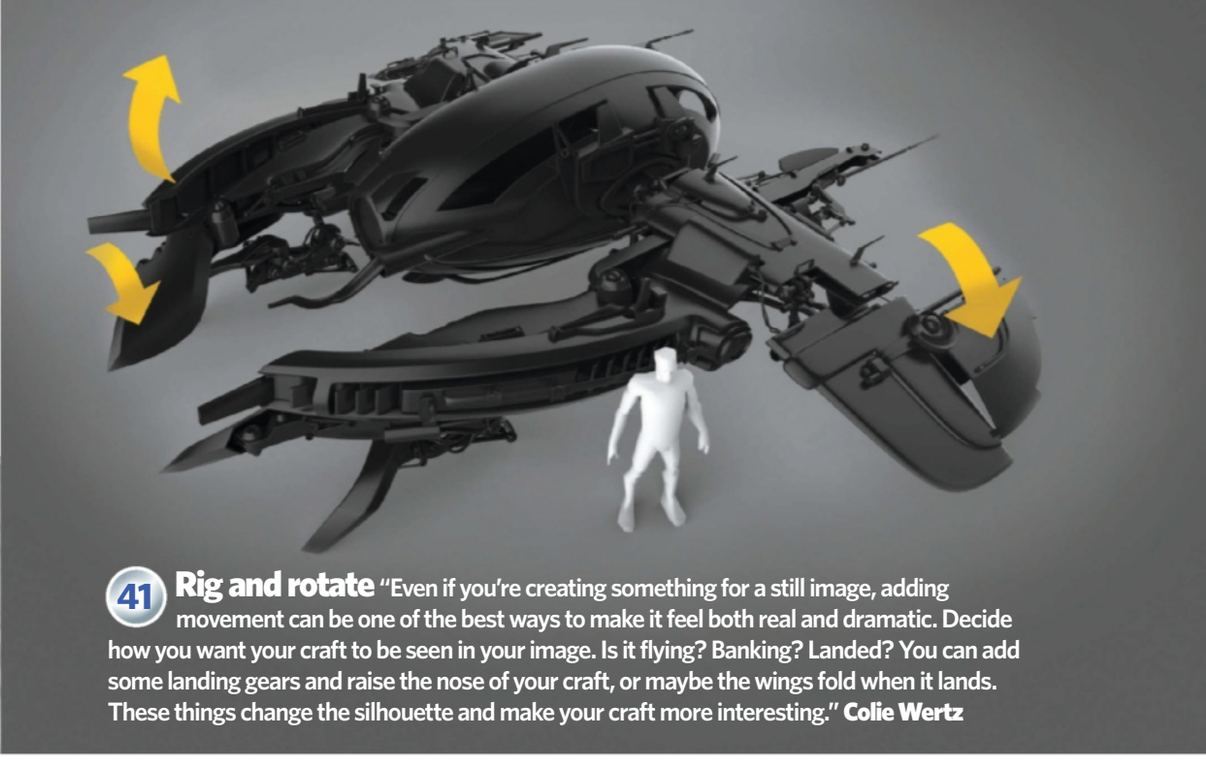
38 Respect your angles **"When working within a highly angular art direction, it is important that all angles function in respect to one another. Parallel lines will generally read better. Having line work that travels in multiple different angles can quickly create a chaotic and disorganised feel in a design." Paul Pepera**

39 Change the function "When deriving functional details from real-world reference, try to think of unconventional ways to use them. For example, a car transmission can become a component of a spaceship's anti-gravity mechanisms perhaps, or a bicycle frame can become the beginning of a transport container for a futurist weapon." **Paul Pepera**

40 Tie everything together "Even a relatively simple prop, like the ubiquitous science-fiction crate, should reinforce the story of the scene that it will exist in. Why does this prop exist in the world? Why was it engineered the way it was? Such contextual elements should be reflected in the design language of the asset and be apparent to the viewer in the initial read. Tell a story with the forms." **Paul Pepera**



These ship sketches show a tension in the angles of the secondary forms that help strengthen the primary form



41 Rig and rotate "Even if you're creating something for a still image, adding movement can be one of the best ways to make it feel both real and dramatic. Decide how you want your craft to be seen in your image. Is it flying? Banking? Landed? You can add some landing gears and raise the nose of your craft, or maybe the wings fold when it lands. These things change the silhouette and make your craft more interesting." **Colie Wertz**

VEHICLES

42 Left brain bad, right brain good "Obviously, if you want to design sci-fi vehicles – be them futuristic planes and cars, or all-out spaceships – a working knowledge of real planes and cars is useful. However, to come up with something new and interesting, sometimes you have to lock that part of the brain down. Try something like Alchemy (**http://al.chemy.org**) to open up your process, or just use blue lead pencil on paper. Light lines, though! Don't commit yet." **Colie Wertz**

43 (Sorta) commit to a form "Now do a sketch model. Using a light marker (I like Copic Cool greys, like a C1) over your blue-lead sketch is a 2D option, but the benefit of building a model is that you can adjust proportions quickly, and shine a hard light on it to find cool shadow patterns you may not see in a sketch. Throw in a basic scale figure. However, don't get bogged down in the software. Go with your fastest, most mindless tool. Maybe it's Play-Doh!" **Colie Wertz**

44 Getting formal "Once you're happy with your design from an instinctual point of view, it's time to analyse what you are creating and develop a 'language of form' for your design and stick to it. Is the design angular? Is it more round and soft? Some of this will be determined by the feel you have in your design from earlier steps. Adding some secondary shapes (intakes, antennae, array pods etc) to your design will help you begin to support your primary form. Now step back and shade it black. Look at the silhouette. Is it interesting?" **Colie Wertz**

45 Just do it "If you're lucky enough to have a brief of what you'll be designing, you're on your way. If not, don't fear because there are exercises for getting the juices going. I try to divorce myself from everything I know when I sit down to start designing something. Today, with mobile devices like iPads and iPhones, you can be designing all the time." **Colie Wertz**

46 Form plus function "Try to make sure your designs look, in some way, like what they are to do. This isn't saying a spaceship that only flies in outer space can't have wings, but wings suggest that the ship will enter an atmosphere. This means it will probably land, which means you need to be thinking about landing gear. The function of your design will hopefully be developed alongside the form." **Colie Wertz**

47 Bring everything together "Once your vehicle's parts (intakes, cockpit, wings, weapons pods, etc) have found a place on your craft, do another pass and blend them into both one another and the overall look of the craft. The various forms need to 'talk' to one another, and opposing angles and directions, for instance, can sometimes create a sense of harmony that is unique to the form you've already created." **Colie Wertz**

48 Paint jobs and panels "Most vehicles are going to need a lick of paint, and there's so much you can do with the quality of the paintwork – the age of it, whether it's damaged or not – to tell a story. Don't forget to marry the panels to the craft and the parts to the craft through your paint job and graphics. Everything in paint and panel should support your forms and their functions." **Colie Wertz**

49 Scene and map "With your model almost finished, it's time to put it in a scene. In Maya you set up a camera, environment light and strong key. This will give you clues on the absolute best angle to shoot it for a still. Now use MARI for your spec, reflection and other occlusion maps. I use MARI, and its setup for exporting and tweaking these maps is wonderful. Go medium on the contrast and adjust it later if needed." **Colie Wertz**

50 The right background "Even if you're not quite finished, do a couple of renders and start thinking about backgrounds. Try and pick a background that supports the craft; one that suggests a degree of vastness, perhaps. I love grey backgrounds, but they usually don't support the idea and story I'm trying to sell." **Colie Wertz**

BEN MAURO DISCUSSES FINDING INSPIRATION

There are lots of clichés in sci-fi design, so how do you keep your work fresh?

I think the best way to avoid clichés is going back to nature or the source material and trying to imagine and create something based on how you think it might look. For example, reading a book that has never been illustrated and imagining what some of those ideas might look like is a very good design challenge. I also think having a good understanding of design history is a good way to avoid clichés; understanding what is out there and trying to think of a new angle to make it different to what everyone else is doing. For example, if everyone is using angular hexagonal forms, try using organic smooth forms. If everyone is looking at real world robotics for design details and forms, maybe look to some really interesting patterns or cellular structures found in nature and try to interpret them and turn them into some form of technology. Just try to think outside of the box and look for different source material to what is currently the most popular design trend.

Sci-fi requires you to create a mood as well as a whole world. How do you tackle that?

Creating a mood is part of creating a new world, helping to set the tone and visuals of where the story is taking place. I begin by asking myself questions, and everything usually falls into place after that. What year is it set in? Where is it taking place? What types of locations? Is it in some underground subway tunnel, or the interior of some future skyscraper? What type of lighting, material or visual cues can I take from that to push it into something more futuristic? What type of scene am I illustrating? Is it a calm moment or an intense moment? What type of lighting and atmosphere should be present in that scene? Continue to ask yourself these questions regularly and it will all fall into place while you work.

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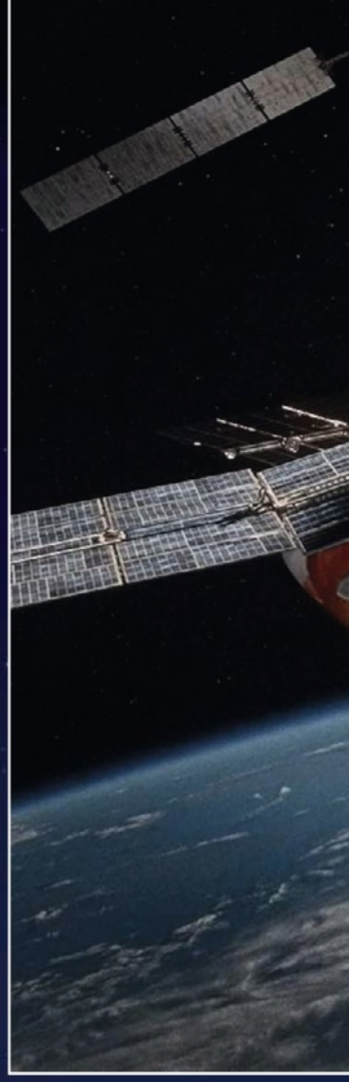
GRAVITY

ONE GIANT LEAP FOR VFX

Larissa Mori takes an in-depth look at how Framestore crafted the visuals behind one of the most groundbreaking films of the year

Interviewees / Alexis Wajsbrot **FX Supervisor** / Anthony Smith **Compositing Supervisor** / Stuart Penn **CG Sequence Supervisor**



At the time of writing, Alfonso Cuarón's *Gravity* – a thriller about a medical engineer and astronaut who, after an accident, are left tethered to each other and fighting to survive adrift in space – has still not been widely released to cinemas in the UK. In spite of this, it has already recouped its cost of $100 million in little more than a week, and is proving to be one of the most impressive films of the year.

In terms of visual effects, *Gravity* is a truly groundbreaking achievement. It's a film with so much CG involved that in all exterior shots witnessed during its runtime everything but the actors' faces was created digitally – right down to the suits and helmets they wore.

Amazingly, it was also a film shot almost entirely without the use of green screen. The actors were filmed using robots; the lighting was created with a 20-foot box filled with LEDs; and an animated version of the entire film was produced before the shoot even took place. All of this was approached with one crucial goal: to make the audience feel like they were truly floating in space, with the cameras, the actors and everything on screen completely free from the effects of gravity.

"Since day one, we felt that *Gravity* was different to all the blockbusters we normally work on in London," begins Alexis Wajsbrot, Framestore's FX supervisor. "Our aims were very high: we wanted to reach director Alfonso Cuarón's expectations and ideally exceed them. We all had the secret goal of making this movie a new standard for VFX in the same way that *The Matrix* or *Avatar* was."

As the primary visual effects house working on the project, Framestore's team, led by visual effects supervisor Tim Webber, were involved in every aspect of *Gravity*'s production. 440 artists worked on the film for a period spanning three years. "Everything started with previs," explains CG sequence supervisor Stuart Penn. Cuarón's trademark long shots – with the opening shot of *Gravity* stretching across 13 minutes – were incredibly CGI intensive, and needed to be meticulously choreographed. This meant that instead of creating a film's normal rough previs, artists at Framestore produced a very detailed animated version of the film from the start. Essentially, post-production was taking place even before the physical shoot.

Animators had to relearn to keyframe movement occurring in zero gravity (motion capture was rarely used, as it would be too noticeably affected by the gravity on Earth). "All of the characters were hand-animated, right down to hands manipulating tools," Penn continues. "Cables and tethers were simulated by our CFX team. Destruction effects were simulated by the FX team." In fact, the animation and previs were taken to such a high level that before shooting even began, the actors' timings and key poses were more or less set in stone.

"During the first few months, it almost felt like a science project," says Wajsbrot. "Our FX work was very different to a normal movie, and consisted of helping the previs artists produce realistic animation." Even if it felt experimental at times, the Framestore team agree it was the unconventional amount of planning behind the film that set it apart, helping them most when pushing the shots towards the realism required. In fact, the initial previs animation of the film would ultimately form the basis on which everything from the actors' poses to the camera and lighting of *Gravity* was built.

> WE ALL HAD THE SECRET GOAL OF MAKING THIS MOVIE A NEW STANDARD FOR VFX IN THE SAME WAY THAT *THE MATRIX* OR *AVATAR* WAS
>
> **ALEXIS WAJSBROT,** FX SUPERVISOR

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Gravity: One Giant Leap For VFX

Before the shoot could begin, the filmmakers had to decide how they would simulate an exceptionally realistic zero-gravity environment not just digitally, but also incorporating actors. It was a problem that even led Cuarón and Webber to take trips on the 'vomit comet': an aircraft that uses parabolic flight manoeuvres to simulate the experience of 0g for up to 25 seconds at a time, with the unfortunate side effect of sometimes causing the participants to lose their lunch. It was a method famously used in *Apollo 13*, but one that wouldn't be satisfactory to power *Gravity*'s intense, heart-pounding and sustained moments of zero-g action.

ZERO G ON SET

"I was first approached to work on *Gravity* by Tim [Webber] to help look at how we might shoot the film, and how we might convert the previs into something we could shoot", says CG sequence supervisor Stuart Penn. "First, the very long shots were turned into 'beats'; smaller sections that could be shot and joined together later. The previs was then put through a 'techvis' process. We analysed it to see how the camera and lighting moved relative to the actor, to see what sort of methodology would suit the shot or beat. With this information, we started looking at ways of shooting zero gravity."

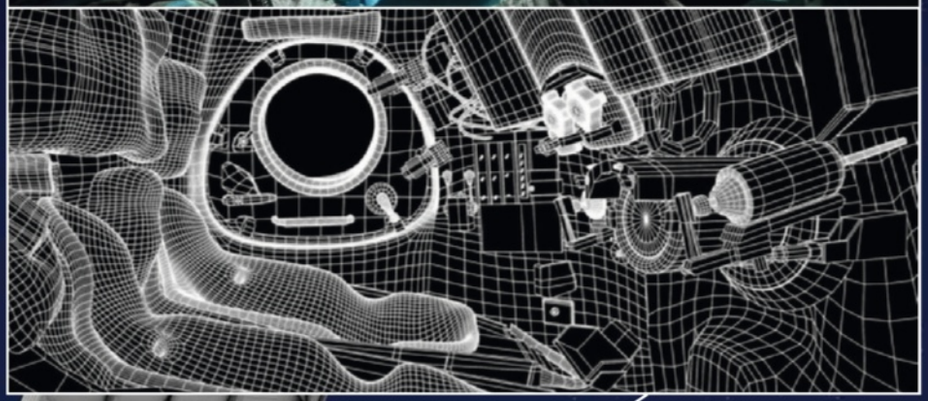
Enter the vomit comet, which along with a wide range of traditional wire rigs, flying harnesses, bicycle seats on a turntable, and even a compressed air-powered hoverboard, were all tested by Cuarón, Webber, the Framestore team and the SFX team led by Neil Corbould. Even the puppeteers from *War Horse* got involved during the shoot to literally manipulate the actors, but none of the methods proved suitable for the long shot durations and complex lighting required of the film.

It was then, Penn tells us, that the filmmakers were introduced to Bot & Dolly. It was this company's motion controlled system that would

The lack of green screens was a disadvantage for the paint and roto team, who had a huge amount of work to do. "They did a fantastic job rotoscoping Sandra [Bullock] when she was out of her suit and painting out the many wires she was suspended from," says Smith

> WE PUSHED EVERY PARAMETER TO THE MAXIMUM RESOLUTION, THE HIGHEST POLY COUNT. WE WERE CONSTANTLY REACHING THE LIMITS OF OUR SET OF TOOLS
>
> **ALEXIS WAJSBROT,** FX SUPERVISOR

"We had six weeks of pre-shoot before Sandra arrived," explains Penn. The small team needed to quickly get the systems working together before testing all of the moves to make sure they were within the capabilities of the robots, and that they worked well within the light box and rig



"We used our entire set of Framestore tools on *Gravity*: Maya, Houdini as well as Naiad," explains Wajsbrot. There were 24 FX TDs working on the show, including three FX leads

enable artists to animate and pre-program on-set robots using a Maya-based workflow. "In July 2010, I travelled out to San Francisco with Alfonso [Cuarón], Tim [Webber] and Neil [Corbould] to try out some of our ideas," he explains. "We tried using three robots: one for the camera, one for the Sun and the other holding a massive umbrella light to simulate the bounce from the Earth." With the new method, instead of needing to uncomfortably move the actors into all the positions required, the robots themselves would help by moving the 'world' around them, shifting the cameras and lights around the actors according to what was needed from the previs animation shots and 'beats'. For Framestore, this meant that the techvis team had to not only work out what techniques the filmmakers could use for each shot, but also how the moves could be shot within the capabilities of the robots and the SFX rigs.

However, Cuarón, Webber and the Framestore team ran into problems once again when they realised that although the Bot & Dolly robot technique could be used on a couple of shots, it wouldn't be practical for moving the lights at the intense speed required of others. So, to enable the lighting on the actors' faces to match that of the fully digital environments, a cube fitted with an array of 4096 LED lights (resembling inward-facing TV screens), dubbed the 'light box', was built.

"In August 2010 we built a prototype light box. We were all impressed, some might say surprised, by how well it worked," continues Penn. A 20-by-10-foot box that the actors could be placed inside, the light box's LEDs would light the actor with the correct timing, and without the need to move them in the middle of static lights. Meanwhile, during the San Francisco visit to Bot & Dolly, Penn also met up with the show's director of photography Emmanuel "Chivo" Lubezki, who worked closely with Framestore's pre-light team using the initial detailed previs animation to generate the lighting directions and look for each shot.

This information would then be used to pre-program the lighting for the light box, using co-founder of Houdini Greg Hermanovic's Derivative Touch Designer setup. With it, the robots, and the light box combined, the team were able to adjust the hue, intensity or movement of the lighting in real-time during the shoot while keeping everything in sync with the robot camera moves. The unusual set would even allow the actors to personally see their virtual world in real-time as the light box lit them acting, rather than having to imagine it on a green screen.

Ultimately, the techvis team took the final previs animation and pre-light work to generate an on-set package for each shot. "This included restaging animation and setting up motion control moves for the robots and other rigs; lighting information to drive the light box on set; and lighting positions for other stages," Penn explains. After four years of being slow development and the meticulous planning process between Webber and Framestore, everything for Cuarón's film shoot was ready.

DOCUMENTARY TECHNIQUES

"Alfonso [Cuarón]'s intention was to give the feel of documentary filmmaking, where the viewer is simply floating around with the astronauts, watching them do their work, and something just happens to go badly wrong. The realism was essential to selling that idea," says Smith.

"Creatively, Tim [Webber] and Alfonso wanted the look of the final images to be slightly degraded, to imply that the filmmakers were unable to shoot with the best possible equipment in space. We often tried to suggest the camera's limited dynamic range by allowing white sunlit surfaces to blow out, or for entire unlit areas to be near completely black. We also chose to apply film grain to the final images, and used a lot of lens aberration, convolution filters and real (often uncoated) lens flares to suggest that the lenses used weren't of the best quality."

Gravity: One Giant Leap For VFX

PUTTING IT ALL TOGETHER

Now that the technology was in place to enable Framestore's previs of the film to be used to create zero gravity on set, the crew had just six weeks before the cast arrived to test out all the equipment working in tandem.

"During the shoot I was based out at Shepperton Studios," details Penn. "Framestore set up an office and we moved a small team there. This was the first time the light box, Bot & Dolly's robots and SFX tilt rig had been brought together and they had to work in perfect sync." Together, the small team in the Shepperton office would refine the moves using dummies and stand-ins to make sure everything was safe for the actors, preparing the technology to be ready for the main shoot. "It was a bit of a balancing act – within Maya we had a representation of the robot provided by Bot & Dolly which would tell us if it was moving with its specification for speed, acceleration and reach. We had to balance how much of the action we would put on the camera robot against how much we could spin the actor around in the tilt rig in the light box. The trick was to find the optimal move for the robot and track while fitting the camera head through the narrow entrance in the light box. The clearance we had was often down to a few millimetres."

> ALL OF THE CHARACTERS WERE HAND-ANIMATED, RIGHT DOWN TO HANDS MANIPULATING TOOLS
>
> **STUART PENN,** CG SEQUENCE SUPERVISOR

Once the actors had given their performance on the unorthodox stage, which allowed for little deviation from the timing and movements already planned out for them by both the previs and the constraining robots, rigs and light box set; the Framestore team got back to work once again. Impressively, this meant that the already very detailed animation was further enhanced, based on the actors' performances, after the shoot took place.

"Post-shoot the plate elements went through the conform process, which took the plate elements of the actors – only the faces for the exterior shots – and allowed them to be repositioned in frame and space. This was fed to the animation team led by David Shirk," explains Penn. "Final animation was passed to the CFX team for simulation of cables, tethers, parts of the suits and the parachute and to the FX team for damage and destruction effects."

"We could not hide behind 'it's magical'; everything had to look photorealistic, as Alfonso [Cuarón]'s main concern is realism," says Framestore's FX supervisor Alexis Wajsbrot. "We pushed every parameter, every slider, to the maximum resolution, the highest poly count. We were constantly reaching the limits of our machines and our set of tools." He tells us that the shots in zero gravity actually helped with simulation, allowing it to be more stable, as there were no forces influencing the rigid bodies before being hit. Even so, the ISS and shuttle destruction shots were two of the most challenging for the FX team due to the resolution of the meshes being destroyed, as well as the length of the shots themselves.

For the creation of the fire, which FX TD Nigel Ankers worked on for seven months for a single shot on the inside of the ISS, one challenge was the lack of good reference in zero gravity. "The only reference points are very small scale, like a match," says Wajsbrot, before going on to tell us that the LED box helped enormously by giving them a plate with the right direction of light from the start. "When we had fire in CG, Sandra Bullock was always correctly lit from the right direction, which helped our CG work to look more realistic, as everything was well integrated even in an early slap comp." Of course, one issue with the light box and robot approach was that – rather incredibly for such a CG-heavy production – a green screen was almost never used due to the fact that a green spill of lighting would end up over the actors. For the compositors, this meant the actors had to be roto'd out of each light box shot.

"For the interior scenes, more extensive work was required, especially where plates shot on different days using different lighting setups were required to be joined together to form a longer shot," begins compositing supervisor Anthony Smith. The interior sequences, which included both CG and real elements as well as the plate joins, represented the most difficult aspect of the film for the interior compositors. Heroically, they worked on everything from painting out the wires Sandra Bullock would be suspended from down to each strand of Bullock's hair, which required particularly careful keying to pull mattes without the benefit of a green screen. For all but one of these setups, in fact, a green screen was never used.

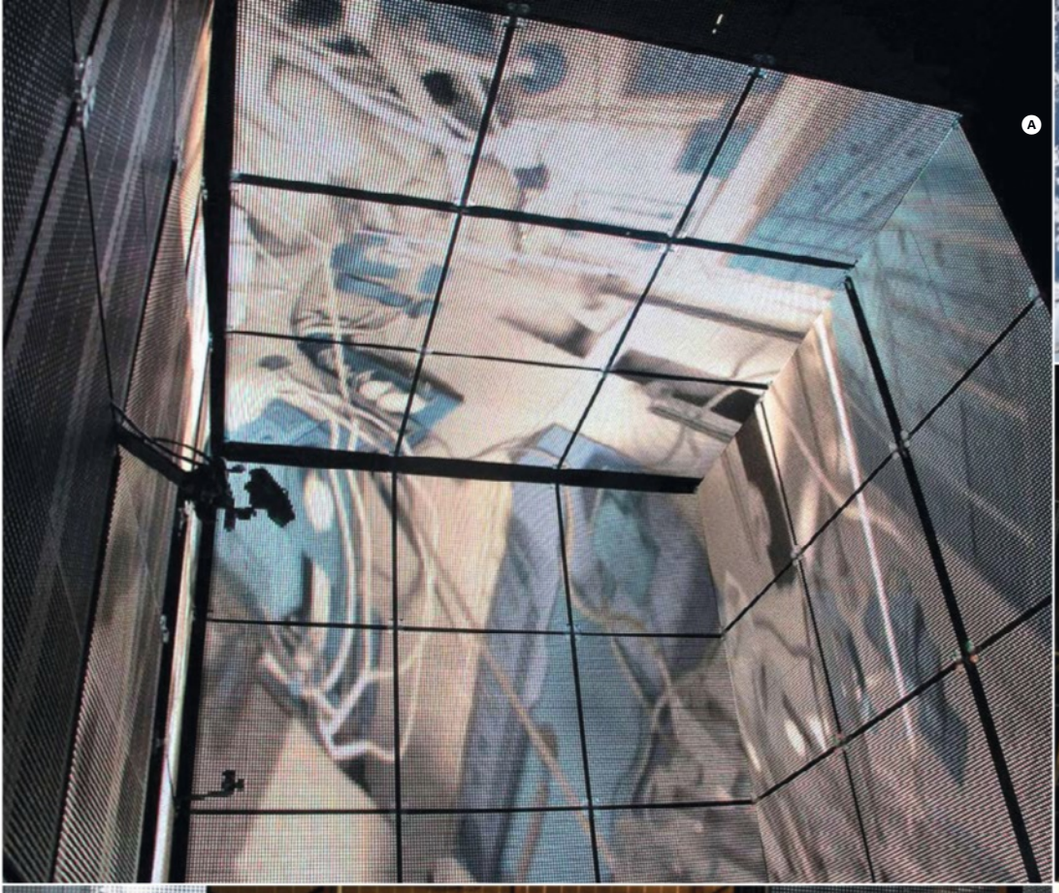
"The longest renders were the ISS interior – as every pixel of the frame had to be rendered," reveals Penn. "The level of detail required to make the interior of the ISS feel real was incredible. Every prop had to be built, textured and look dev'd before being placed or animated – and being in zero G, there had to be a lot of things floating around colliding with each other and Sandra [Bullock]."

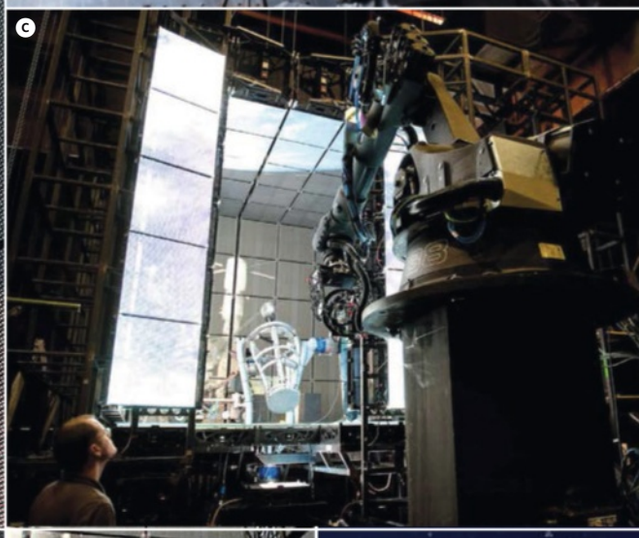
The level of detail from the Framestore team is not too surprising, however, considering the attention that went into the construction of the stars alone. "We constructed a celestial sphere from a database of the 120,000 or so of the most visible stars from the Earth, which contained information about relative positions, velocities and so on – which we converted into hues and intensities. This meant we had the correct constellations in the correct positions," explains Smith. "We then filled the remaining gaps with clouds of other stars created by duplicating the existing stars at lower exposures, until we had over 30 million in our starfield, all of which were completely controllable and rendered from NUKE by the movie's compositing team."

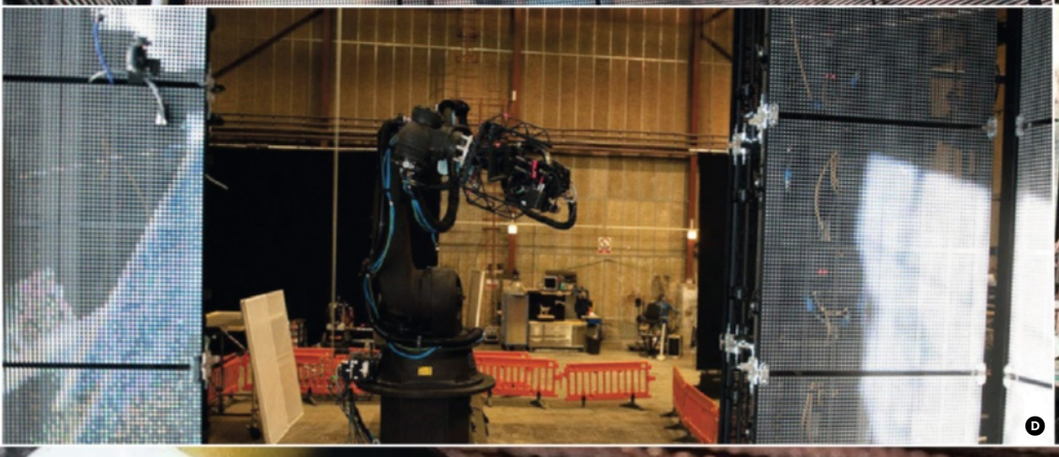
There was even an Earth team, which, led by Kyle McCulloch, set about creating what was called the film's third character. On set, it was simply a globe with a piece of string taped to it, only becoming the glorious asset it is in the computer. "Shaders were developed to simulate clouds and atmosphere, and renders were split into layers that gave the compositors the flexibility to show any part of the Earth at any time of day, with final tweaks done in matte painting," Penn continues. "Everything was brought together by the comp teams led by Mark Bakowski and Anthony Smith, where additional lens effects, visor effects and more were added."

RENDERING WITH ARNOLD

Wajsbrot tells us that *Gravity* marked the first show at Framestore where the FX team would not be rendering the FX themselves, but rather passing it on to the lighting team, led by Paul Beilby, for stereo rendering in Arnold. This was another first for Framestore. "On the rendering side, we investigated all the renderers available, specifically looking at physically based ray tracers, finally settling on Arnold," Penn explains. "We then had to build up a new shader library from scratch to handle the range of materials we needed, including the metals on ISS; the heat-resistant tiles on the space shuttle; detailed cloth for the space suits; the translucent cloth of the Soyuz parachute; and skin for facial and body replacements. We also developed an optimised stereo rendering system within Arnold that allowed us to cache data between the eyes to massively reduce render times on the second eye."







A C D E
Although the light box was pre-programmed, the team built in a degree of flexibility to get the best effect on the actors. With Touch Designer, the crew was able to adjust the lighting of the LEDs in real-time on set

B
Initially, Cuarón cast Bullock and Robert Downey Jr. for the leads. Downey subsequently dropped out, reportedly due to the non-improvisational nature of the shoot

For the exterior shots – where the Framestore team were only using Sandra's and George's heads from the plate, – the actors' faces were dimensionalised to fit into the stereo comps

Gravity: One Giant Leap For VFX

The film's space debris disaster is actually a real possibility. This scenario is known as the Kessler syndrome, proposed by NASA scientist Donald J. Kessler in 1978

WORKING TOGETHER

After years of work and experimentation with new ways to shoot long shots in zero gravity, and the creation of the previs, techvis, conform process and FX, all with the aim of making *Gravity* a new VFX breakthrough, it must be satisfying for all involved to have achieved the results so spectacularly. "Our main aim was to make it look as real as possible, so that the audience would feel like they were there in the middle of the action, to feel like they were in space," says Penn. "It's been great to read reviews from real astronauts and have them comment on how like being in space it feels."

Undoubtedly, one of the main things *Gravity* has highlighted is that a fundamental element to great VFX is planning. "Planning was the key to this film's success," states Smith. "Alfonso [Cuarón] was able to make and remake his film until it was just the way he wanted it before it was shot, and that was what made it great." However, it was not just planning that was central to Framestore's success. Working so closely with the filmmakers and crew played a huge part too, with Webber and the Framestore team being heavily involved very early on as part of both the previs process and also playing a part on set: something that doesn't happen often.

"Alfonso [Cuarón] and the film's production had their offices adjacent to the artists," Penn continues. "We worked very closely with SFX, the production designer, the art department. We really felt like filmmakers rather than just the VFX crew."

"That was probably one of the best things about working on *Gravity*. We had the chance to have daily reviews with Alfonso Cuarón and Tim Webber, so the whole team felt even more involved with the project and everyone was pushing hard to make *Gravity* even better," explains Wajsbrot. "I guess we had a very similar experience to working on an animation movie, where the whole studio read the script and could have interaction with the director."

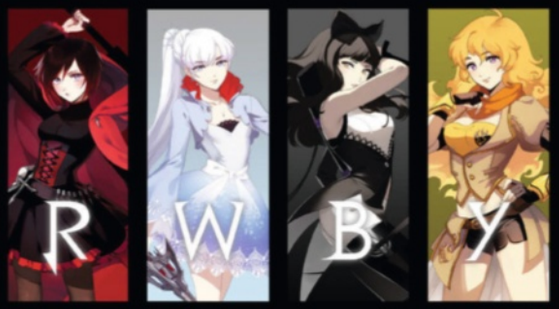
The passion and incredible team effort is clear in every shot of the film, every pixel illustrative of the time and effort poured into the project's creation. It's good to see then, that for one of the first times ever, the VFX artists received top billing in the credits. "In terms of recognition, I think Alfonso [Cuarón] and Warner Bros.' decision to credit the VFX artists at the top of the credit roll is a huge mark of respect for the effort we all put into the film. We're all extremely proud of it," says Smith.

"The biggest success has to be the fact that so many people love it but don't know how it was done," he concludes. "That so many of the viewing public – as well as other VFX artists who are so used to blockbuster effects – can come out of a cinema and be so affected by the power of the film, yet have no knowledge of the techniques used to make it, shows how truly groundbreaking it is."

DESTRUCTION IN SPACE

"For the destruction, I remember at the beginning of the project Tim Webber saying 'It's metallic structure not rock, it's supposed to bend and deform before breaking'," says Wajsbrot. "We had to develop a way we could have some super high-res geometry bending, deforming and then breaking and colliding with a very large amount of rigid bodies." After testing solutions such as nCloth and soft bodies, the team built a system that allowed deformation using an RBD solver, so that a single mesh could have multiple rigid bodies constrained together to drive it, which would allow for deformation. The in-house tool allowed for fast, detailed deformation to be performed on millions of polygons, and was so successful that even the modellers on *Gravity* used it to help them build assets of damaged structures.

> IT'S BEEN GREAT TO READ REVIEWS FROM REAL ASTRONAUTS AND HAVE THEM COMMENT ON HOW LIKE BEING IN SPACE IT FEELS
>
> **STUART PENN,** CG SEQUENCE SUPERVISOR



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Re-creating the Cretaceous: WALKING WITH DINOSAURS

3D Artist talks to the talented artists at Animal Logic, discovering how the team is bringing prehistoric creatures back to life in *Walking With Dinosaurs: The 3D Movie*

A major new blockbuster presented by Twentieth Century Fox and Reliance Entertainment in association with IM Global.
A BBC Earth Films and Evergreen Studios production in association with Animal Logic

CONTRIBUTORS
Animal Logic, Australia

Barbara Meyers
Title Lighter
Key projects
Rise of the Planet of the Apes
The Lord Of The Rings: The Fellowship Of The Ring
Shrek

Matt Everitt
Title Animation lead
Key projects
The LEGO Movie
Happy Feet Two
The Tale of Despereaux

Emmanuel Blasset
Title CG supervisor
Key projects
The Matrix Reloaded
Sucker Punch
Legend of the Guardians: The Owls of Ga'Hoole

"Since the original BBC documentary, everything is a little quicker, a little less painful, but we're still trying to push things as far as we can. It's just taking things up to the next level"

Matt Everitt, animation lead

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Walking With Dinosaurs

Jurassic Park may have been 65 million years in the making, but it seems an extra period of 20 years has made all the difference for the Australian-based Animal Logic.

It was back in 1993 that Industrial Light & Magic used bleeding edge technology to give cinema-goers the first opportunity to see authentically realised prehistoric creations brought to stunning life in Steven Spielberg's seminal blockbuster. Realistically stomping onto the big screen, *Jurassic Park* kick-started an audience fascination with the gargantuan creatures that once roamed planet Earth. But how accurately were the dinosaurs portrayed in that film? And what was life really like for dinosaurs surviving in the wild?

These questions provided the inspiration for the film adaptation of BBC series *Walking With Dinosaurs*, heading to cinemas in December 2013. Australia-based Animal Logic is the VFX production house going to painstaking lengths to accurately bring dinosaurs to life on the cinema screen, unlike anything we've seen before.

Working closely with leading palaeontologists, the studio found that the general perception of how these animals lived is actually rather removed from the truth. "Instead of dealing with art directors and designers, we've been working first and foremost with palaeontologists on this project," explains CG supervisor Emmanuel Blasset of *Walking With Dinosaurs: The 3D Movie*. "They will all tell you that they have found out more about dinosaurs in the last ten years than they found out in the 100 years before that. In terms of what they think dinosaurs look like today, it's completely different to the ideas they had 20 years ago."

As such, a new approach was demanded of every facet of creature design, from concept through to animation, texturing and lighting.

"Palaeontologists have recently discovered that lots more dinosaurs had feathers instead of skin, and the ones that didn't are the more complex, reptile based ones," continues Blasset. "Rather than the skin depicted on *Jurassic Park*, we're actually dealing with scales, a surface that is composed by a rigid core surrounded by soft tissue that stretches non-uniformly. So, it's only the material in-between the scales that stretches and compresses. That's the stuff that we didn't know at the time they were creating *Jurassic Park*."

This newfound knowledge was just the starting point, however, and as the studio found it had to alter its viewpoint of a dinosaur's anatomy, it too had to evolve. During our time talking with Animal Logic, **3D Artist** discovers that it's not just the scientific understanding of dinosaurs that has transformed massively over the past 20 years since that T-Rex burst through its paddock towards an astounded audience, but so too have the tools and technology required to bring such extinct animals back to vibrant life.

WORKING WITH 3D

Animal Logic's CG supervisor Emmanuel Blasset discusses the challenge of working in stereo

"This was our first live-action stereo project, and we started about two and a half years ago," says Blasset. "Very early on we tested everything, ensuring that we had a successful stereo integration of a character on the plate. It's not like a bad VFX shot, where if you do a bad shot then people will just pick up on it. If we don't do our job right as far as stereo graphics are concerned, it'll give people an actual headache. It's very important people are not distracted by errors or things not working properly in the stereo plane. It it was important for us to get that right."

One of the challenges on the project was developing the muscle system. "The creatures are huge and muscular, so we needed to develop a more sophisticated system that allowed for the proper modelling of large muscles," says Blasset

UNDER "NUKE played an important part in our Lighting Process," says Barbara Meyers. "What we couldn't do easily in 3D we could do in NUKE. It was knowing how to balance the two, so that we never had the 2D flattening out the 3D effect we worked so hard to achieve"
LEFT Animation lead Matt Everitt discusses the directional style of the film: "We used long lenses so it felt like we were literally shooting a documentary, and then played around with the image"

Technology evolved

Owls would not be the most obvious source of inspiration when it comes to creating dinosaurs, but for Animal Logic, the modern-day bird served as the foundation for how it would build some of *Walking With Dinosaur's* most distinctive breeds of prehistoric beasts.

"We were lucky because just before we started working on *Walking With Dinosaurs* we had finished working on a feature called *Legend of the Guardians: The Owls of Ga'Hoole*; an animated feature with owls that obviously featured a lot of feathers," explains Blasset. "We have always tried to push for the photorealistic look, so we had a very strong base to start with. The main difficulty creating the dinosaurs in our movie that had feathers was that they are much larger than owls. It added to the complexity when dealing with ten times more feathers which were also longer, giving them far more complex behaviour as the dinosaurs became more and more dynamic."

In particular, two of the film's most prominent feathered breeds, the Hesperonychus and Troodon, had to bear intense scrutiny in close-up shots, with Animal Logic further enhancing its own proprietary tools to reach the perfect look for their unique textures and flowing bristles. "That was a difficult thing for us," admits Blasset. "When creating feathers we use an internal feather system called Quill, which we use to simulate everything from the individual barbs on each feather to the full groom of the creature. It's quite nice because you can get right down to the minute detail."

The team didn't just need to work on the look of the feathered theropod dinosaurs, but also the surface detail and skin of more conventional breeds, such as the Pachyrhinosaurus – the central hero of the story that guides the audience through the Late Cretaceous period. Developing the technology to convincingly replicate the rough, durable, scaled surface of the dinosaurs' skin, akin to that of a reptile, was one of the biggest challenges for the VFX house, as Blasset explains.

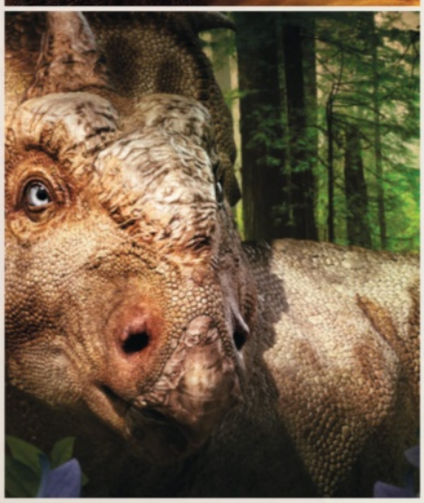
"For this project, we already had a muscle system in place from the start, so we decided to develop a procedural scale-based system to achieve a complex surface. We shifted to a heavier ray traced approach, still using PRMan but rewriting our shading engine and lighters. Typically when you do that you try to limit the complexity involved, but for us, as we went down a path of trying to realistically simulate the surface of the dinosaurs with a scale-based system that shows individual scales on the surface of the character, we often increased the amount of geometry in the scene. So, it was a very interesting challenge to juggle the additional geometry complexity as well as the sheer amount of calculations that needed to happen on the rendering side."

Outside of its own technology, the studio used a selection of off-the-shelf software, such as Photoshop for design, ZBrush for sculpting and modelling, and MARI for textures. Animation was completed with XSI, again using a variety of proprietary rigs and muscle systems, the flexibility of which was integral to achieving a look that would bear the scrutiny of stereoscopic 3D.

"In terms of the musculature, the skin sliding and the dynamics, from day one this film was about looking good and finding ways to enhance the stereo experience," animation lead Matt Everitt tells us. "With regards to the muscles, it's about creating a great system that helps to sell the weight and believability of the world you're trying to build. Since the days of the original BBC documentary, everything is a little quicker, a little less painful, but we're still trying to push things as far as we can. It's just taking things up to the next level, really."

"We shifted to a heavy ray tracing approach, still using PRMan, but rewriting our shading engine and lighters," says Emmanuel Blasset, discussing the physically-based shader model

Walking With Dinosaurs



"I can't tell you how happy I am to have subsurface scattering," says Meyers of the newly evolved tools since the initial documentary was worked on. "This allows us to get that 'juicy' quality, which so important when creating the illusion of a living character or creature

Terribly convincing lizards

The Pachyrhinosaurus – or Patchi as he's affectionately referred to in the film – is the hero at the centre of *Walking With Dinosaurs*' narrative. Weighing around three tonnes, standing at eight feet tall and predicted to reach speeds of 28mph upon reaching adulthood, the challenge for Animal Logic was to make Patchi stand out among the herd without belying the science.

"The palaeontologists came on as specialists, so there's no room for argument," laughs Blasset, detailing the process of bringing Patchi to the screen. "We received a very specific brief based on skeleton reconstructions. They would redraw the skeletons for us, matching the proportions of the creature, filling in all the gaps for us, and then provide exact drawings of what they interpreted to be the muscle mass, how much fat there was and how much skin was on top."

From there Blasset and his team utilised ZBrush to sculpt the proportions of the creature and map out surface qualities, before receiving approval from the palaeontologists. They would validate details further by creating a rapid prototype with a simple rig to map out proposed animation, before moving onto surfacing followed by further grooming, detail and painting.

While experts were used to precisely pinpoint the look and feel of the dinosaur, animation had the daunting task of interpreting how it moved. Rising to the challenge, animation lead Matt Everitt explains how the studio used today's animal kingdom as a reference point: "Working in XSI, we had our library and toolset that we would use to piece core motions together," he explains. "We spent a lot of time in pre-production creating these core motions for all the hero characters in the film. We looked at rhinos, giraffes, chickens, deer, Komodo dragons, ostrich, secretary birds – you name it, we studied it. We looked at whatever we could gleam from what's around us at the moment, studying everything from locomotion to how animals would react to stimuli, or even how they would emote."

Indeed, creating that tangible connection with the audience was key in all areas of production. Barbara Meyers, senior lighting TD at Animal Logic, expresses the importance of lighting when imparting personality: "The lighting of the dinosaurs often proved to be very challenging, due to their unique physical features," she says. "The eyes are very important when lighting any character, and dinosaurs have very small eyes. Horns and frills also created some unwanted shadowing of facial features. Nevertheless, it was always the goal to make the dinosaurs look as realistic and as lifelike as possible. We worked hard to overcome these issues, as we did not want to impede the audience from reading the emotion of the characters."

Building a prehistoric world

Creating the perfect dinosaur – right down to the tiniest flecks of mud lodged between its scales – is important, but so too is placing them in an environment equally as authentic. To retain the immersion of documentary filmmaking, the vast majority of the movie was shot using a myriad of breathtaking real-world locations that could convey the harsh realities of the dinosaurs' natural habitat. Inserting the dinosaurs into these locations presented an interesting challenge for Animal Logic, not least in making sure that the animals were properly simulated on-set during filming.

"Dinosaurs are huge!" exclaims CG supervisor Emmanuel Blasset when we ask how the dinosaurs were represented within the live-action shots. "We knew exactly what the dinosaurs were meant to be doing on each shot, so the first thing was to properly block the performance on-set with silhouette cut-outs. After that it was about re-shooting the plate. In terms of how to properly integrate them, the very traditional and simplistic approach is to do a HDRI and match the lighting and the footing in the environment.

"It is imperative that you have the dinosaurs sitting on the ground at the correct depth and properly track the camera," continues Blasset. "There are so many things you get away with in a single-camera mono film that don't fly when you're making stereo. As such, we made extensive use of LiDAR scans. Every set that we shot, we scanned the environment multiple times."

In fact, when ensuring tracking was completely accurate, it was crucial for the production team to tag the GPS coordinates of camera starting positions, particularly when filming within forests and wide, open spaces.

Matching the lighting seamlessly between the live action and CG elements was also key to convincing audiences that they really are stepping back millions of years into the prehistoric era. "It's always easier to light against live-action plates than it is to do full CG," states Barbara Meyers, whose background includes working for DreamWorks Animation as a senior lighting artist. "Now we can implement HDRIs and that gives us a whole physically-based lighting system. However, the biggest challenge in *Walking With Dinosaurs* was the Frozen Lake sequence because it was one of the show's full CG environments. Getting that look for the ice and having the cameras underneath the water, the cracking of the ice and the texture of the ice was complicated. I think the shading supervisor did a fabulous job of replicating the ice and having that shader working with the lighting really well. Then of course, matte painters helped us to integrate everything to make it seem more realistic.

"I was also key lighter on the project, so I key-lit the shots that I did the concept art for [Meyers was also involved during the concept art phase]. I didn't know that was going to be the case. Because of my background in 3D, I didn't paint anything that I knew couldn't be lit in 3D, which happens quite often when you have 2D illustrators. So for me, it was nice because as I was drawing I was actually lighting; I was setting the lights up to see how it'll work in 3D. So, when it came to getting the concepts approved, we already had the light rig. That was the first time I had ever done that," Meyers concludes.

BUILD YOUR OWN DINOSAUR

Animal Logic's senior lighting TD Barbara Meyers and animation lead Matt Everitt offer tips on creating a realistic dinosaur

"I think for me it's just making sure that the skin looks realistic," says Meyers. "It's the balance of the subsurface scattering and the shading that's very, very important. There are physics that need to happen too; the animals have to look like they have that weight and muscle underneath."

Everitt agrees: "I think it's the same no matter what you're animating. Whether it's a dinosaur or a stick with eyes on it, it's the weight, the timing and the feel. If you animate a T-Rex like we do in our film, it's menacing and it's meant to be scary, but it needs to have that sense of feel to it. The audience are meant to connect with it and that just takes practice. It's about training your eye to be able to see weight in a character and to know how to take a frame out here and add the frame 20 frames later, which can change the whole weight and mass of a character. Nothing substitutes practice," he concludes.

"We looked at rhinos, giraffes, chickens, deer, Komodo dragons, ostrich, secretary birds – you name it, we studied it"
Matt Everitt, animation lead

Walking With Dinosaurs

"From show to show, the problems are always 'How can we do this number of shots in the time we have to the best quality we can?'" says Matt Everitt. "'How can we squeeze the most out of our animators without turning them into zombies and keeping it an enjoyable experience?'"

Bringing characters to life

The most discernible difference between *Walking With Dinosaurs: The 3D Movie* and its television counterpart is how the characters at the heart of the story are portrayed. Animal Logic had to ensure that Patchi and his family resonated with audiences on a deeper level than any of the creatures featured in the original television series, balancing biological accuracy with emotive behaviour. Ensuring the characters were both animalistic and yet emotionally engaging was no simple task.

"We tell the story from the point of view of the little baby dinosaurs – everything is seen through their view of the world," says animation lead Matt Everitt. "Everything is shot quite low, and as the character grows, we grow with it. It's trying to see and feel the world from their perspective. It's sort of using creature animation, but pushing it more towards the character side."

Everitt insists that, while the movie frames its cast as characters within a narrative, it refrains from portraying the dinosaurs as cartoons, instead staying within the realm of realism. "Every gesture, pose and movement is as it would be in natural history," Everitt explains. "We didn't want to Warner Bros. things up or lip sync dialogue. When we look at animals, we tend to project character and emotion into them anyway, and it's surprising what you can do by simply making an animal behave naturally. Then every now and again you'll give it an extra accent, a little head cock to react to something. You just naturally start to understand how the character is thinking and feeling. But despite this, we still keep everything within the laws of believable natural history."

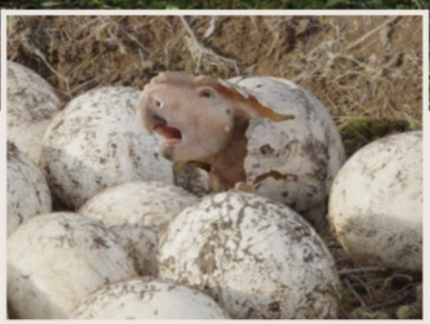
Emmanuel Blasset expresses that it's a fine line when balancing character and factual authority: "It's important to be true to the animal as we know them to be through the work of palaeontologists. We needed to make sure their behaviours are all correct, but we are also trying to tell a story.

"At the time when we were producing the film, we knew the range of emotions and what the story was, but we didn't know exactly what the overdubbed narration was going to be. Our job was more focused on what was the intent of the characters within a specific sequence and the range of emotion we have to read from them. You don't read those emotions from those characters with raised eyebrows and grimacing; it's very subtle hints through the eyes. Sometimes their reaction is that they're scared or something surprises them. All of this can be portrayed in a very natural way that still maintains the animalistic behaviour."

While our understanding of dinosaurs has evolved alongside advancements within the visual effects industry, and while both have converged to make the cinematic debut of *Walking With Dinosaurs* a profoundly accurate and immersive experience for audiences, the real achievement of the film is in establishing that unique relationship between the viewers and the characters.

"I would say that my proudest work is at the start of the film when the hero is a baby and you first come into contact with him as a character," concludes Everitt. "It's got a lot of emotion, a lot of heart and, if we've done our job right, he's the kind of creature you want to take home as a pet!"

***Walking With Dinosaurs: The 3D Movie* is in cinemas 20 December.**



BEYOND THE TV SERIES

It has been over a decade since *Walking With Dinosaurs* first debuted on television screens. CG supervisor Emmanuel Blasset explains the evolution in visuals since the original show: "The most obvious challenge was to create very photorealistic, almost tactile creatures in a way that you haven't seen them before. That's the difference between now and ten years ago when the original series was done. We really wanted to push the believability and look of those creatures and help set a new benchmark. We worked closely with the palaeontologists and we made sure that we didn't do anything outside of the scope of what they felt was believable according to their findings. Then we would push all our power into the muscle simulation, the look and the surfaces of those creatures to make them as real as possible."

> "We worked closely with the palaeontologists and we didn't do anything outside of the scope of what they felt was believable"
>
> **Emmanuel Blasset,** CG supervisor

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Render a dinosaur in Blender

Pteranodon of the Cretaceous Period 2013

In this conclusion to our three part Blender series, Jonathan Williamson takes a look at shading, lighting and using Cycles

Jonathan Williamson runs www.blendercookie.com, where he teaches Blender through tutorials and courses alongside his fellow instructors

With the Disc

Tutorial files:

- Final scene
- Final compositing file
- Skin Shader
- Texture files for render
- MultiLayer EXR files and backgrounds

Learn how to

- ☑ Use Cycles Shading nodes
- ☑ Set up lighting for Cycles
- ☑ Optimise settings for faster render times
- ☑ Set up render layers for more control
- ☑ Work with Multilayer EXRs
- ☑ Use Blender's compositing nodes
- ☑ Using Node Groups

Step by step

Easy-to-follow guides take you from concept to the final render

Artist info

Jonathan Williamson

3DArtistonline

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Personal portfolio site www.cgcookie.com/profile/jonathanwilliamson

Location Kansas City, USA

Software used Blender

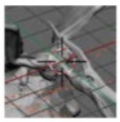
Expertise Both organic and hard-surface modelling, as well as a big focus on topology

Picking up where part two left off, in this tutorial we will finish creating our pteranodon scene in Blender. We'll be using the Cycles render engine, and so we'll start by setting up the shading nodes and scene lighting. Once these are complete we'll move on to optimising the scene setup and render configuration. Finally we'll jump into the compositing nodes to put the finishing touches onto our render.

Beyond this, you'll also learn some handy tips and tricks for working smarter in Blender. This includes linking and appending assets, using render layers and instancing with node groups.

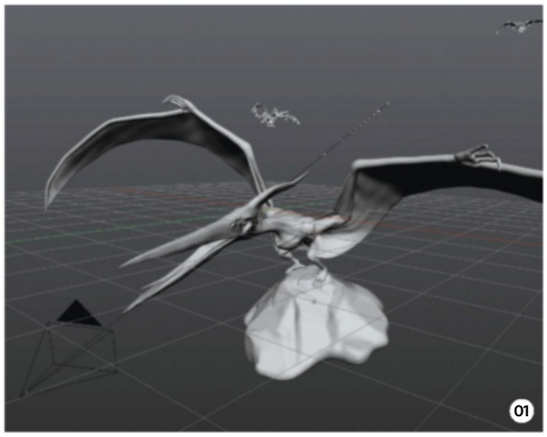
Concept

The final render of the pteranodon should give a sense of the environment it may have lived in. To achieve this I worked with a concept artist to create an environment with lush rivers and red cliffs.



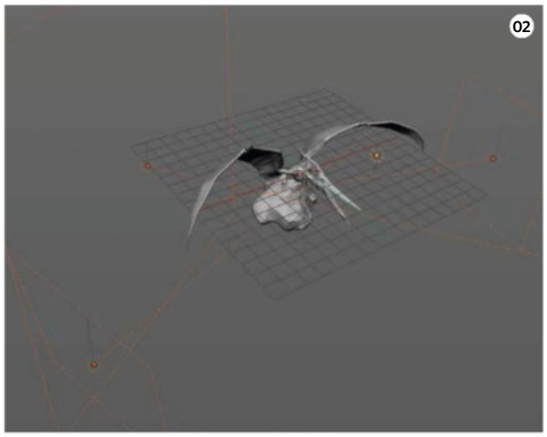
Scene, shaders and lighting

Begin by creating the foundations for the render

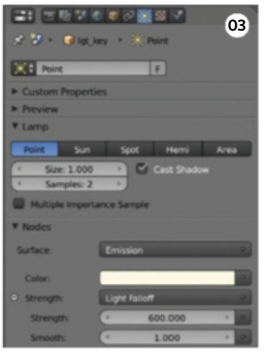


01 Set up the scene The final pose of the pteranodon finds it perched on a rock, roaring at the camera. To create a scene like this you must start with a new file. Import the pteranodon (including the rig) from the model file using File>Append. This will add the pteranodon to the scene. From here you can pose the model and add any additional assets. After you're happy with the pose you can do some clean-up sculpting to fix any deformations. This is also a good time to sculpt in more life to the pose. Since this is a still scene we don't need to worry about shapekeys for animation deformations. To finish the scene set up I append two more instances of the pteranodon and place them at varying depths in the background.

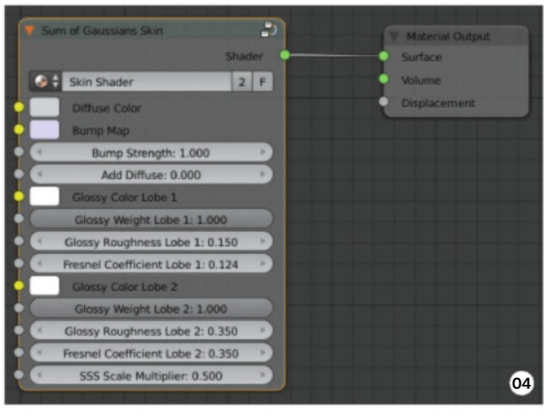
02 Start lighting Once happy with the scene setup perform an initial lighting pass. This lighting pass will likely require tweaking as you work through the Skin Shader in the following steps. The lighting in this image is fairly simple. It's comprised of a key point light, two fill area lights and a large area backlight. This is then complimented by an environment Sky Shader, making use of the Hosek/Wilkie sky model included with Cycles in Blender 2.69. Each of the lamps have either warm or cool colours, adding a better sense of depth to the scene.

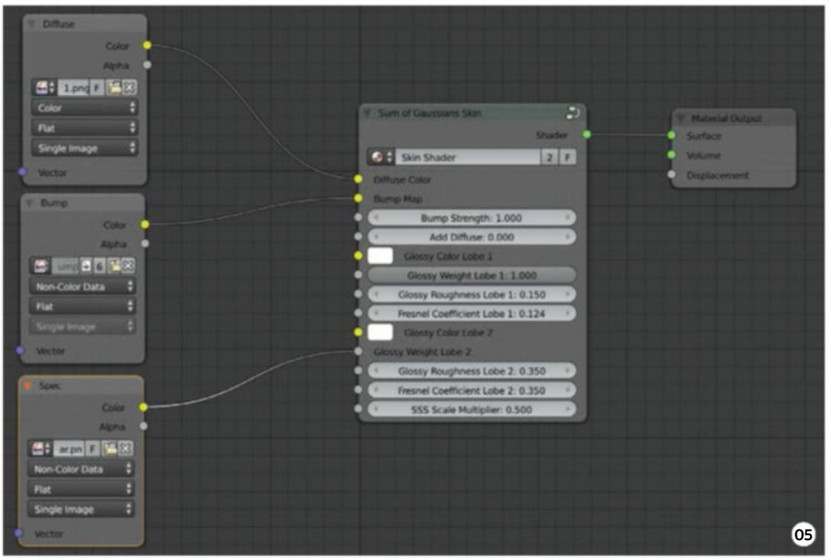


03 Adjust key light settings All of the lights have fairly similar settings. You can see the key light settings shown in the screenshot, supplied with this issue. The key light is the most powerful and prominent light source. Both fill lights have a lower strength, while the backlight is large and very bright so as to provide a bit of lightwrap around the model.



04 Create the skin shader After the lighting pass it's time to add the skin shader. The shader used here was built by Matt Heimlich. You can find it in the source files supplied with this issue. This skin shader is slow to render, but if provides very nice results with limited effort. In this example I have tweaked some of the settings, but I am mostly utilising the default settings. Since the skin shader is a node group, which is comprised of many nodes, I prefer to append it into the scene from a library file stored on my drive. The node group allows me to adjust each input while also keeping it clean within my node editor. Again you can link the Node Group in, as with any other asset, using File>Append.





Use linked groups for easy reuse

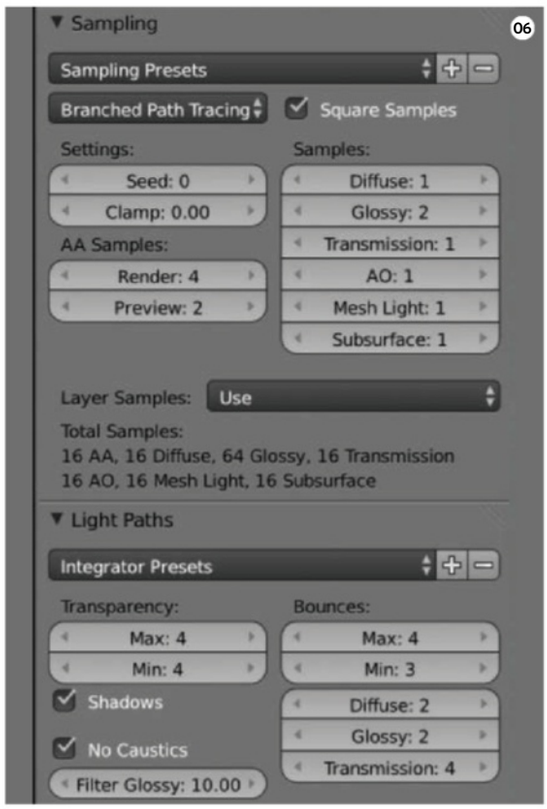
For the skin shader I've chosen to use an appended node group. However, I could make this process even easier by opting for a linked group. Linked groups, and other linked assets, keep their connection to their source file. This allows you to update the source at any time and automatically propagate those changes to all linked instances. Linked groups work really well for creating a handy, reusable shader library.

05 Add texture maps Next up, it's time to connect the texture maps we created in Part Two (issue 61). This is very straightforward, it's just a matter of adding an image node for each texture and connecting it to the correct input of the skin shader group node. In this case those inputs are Diffuse Color, Bump Map, and Glossy Weight Lobe 2.

The rendering process

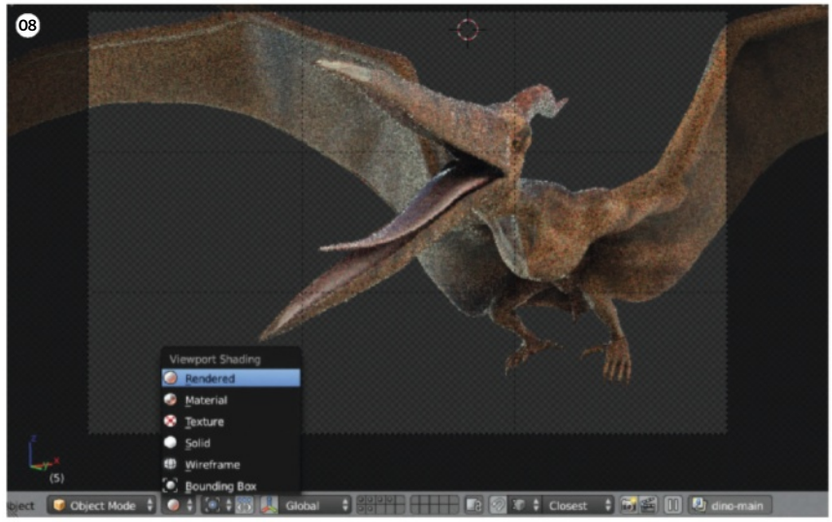
Launch Cycles and set up your render

06 Adjust render settings With the lighting and skin shader set up, we could now create the other shaders required for the scene. For now, though, we'll move on to adjusting render settings so we can start taking a look at the final result. Cycles is a powerful render engine, but it can also be slow. This is particularly true if you're rendering on the CPU. For optimisation, I'm using Branched Path Tracing with Squared Samples. This makes changes more substantial, leading to faster fine-tuning. I've also adjusted the Light Paths settings to bring the sample count down.



07 Make render layers The next step in preparing our render is to break it up into render layers. This gives much more control while compositing, and also makes it easier to re-render specific elements of our scene. I've created a render layer for each instance of the pteranodon and one for the rock. Note that render layers use the scene layers for separation, so be sure to move each of the objects to their own layers. In the Layer panel, Scene are the layers that will be taken into account for the render; Layer determines which layers will actually show in the image; Exclude allows you to disable to layers entirely; and Mask lets you mask overlapping objects within layers.

08 Viewport rendering While working on the lighting, shaders, and render settings, I recommend using the Viewport Render shading mode for quickly testing the results. This makes it very easy to see your changes without needing to wait for a render to finish each time. The viewport render is interactive, so you can navigate around the scene while rendering to look at the changes from any angle, making sure it looks as you want it to.



Faster viewport renders

For faster viewport renders turn down the Preview setting. This way Cycles will compute less samples in the viewport than at render time. With Branched Path Tracing this will be the AA Samples count. For regular Path Tracing it's merely Samples. Both are found in the Samples panel of the Render Properties.

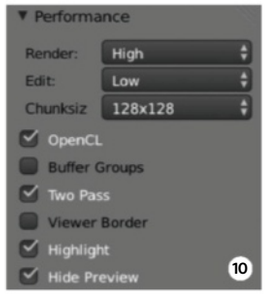
09 Save MultiLayer EXR files We are almost ready to render the scene. Set up your camera with a composition and specify the size in pixels you wish to render. The size can be set from the Render Properties, in Dimensions. When the scene is ready, press F12 and go get a coffee – it may take a while. Once it's finished you'll see the final render in the UV/Image Editor. To make things easier in compositing, and to make sure we don't lose anything, we'll save out the render to a MultiLayer EXR. This will save each of the render layers and render passes into the same file.

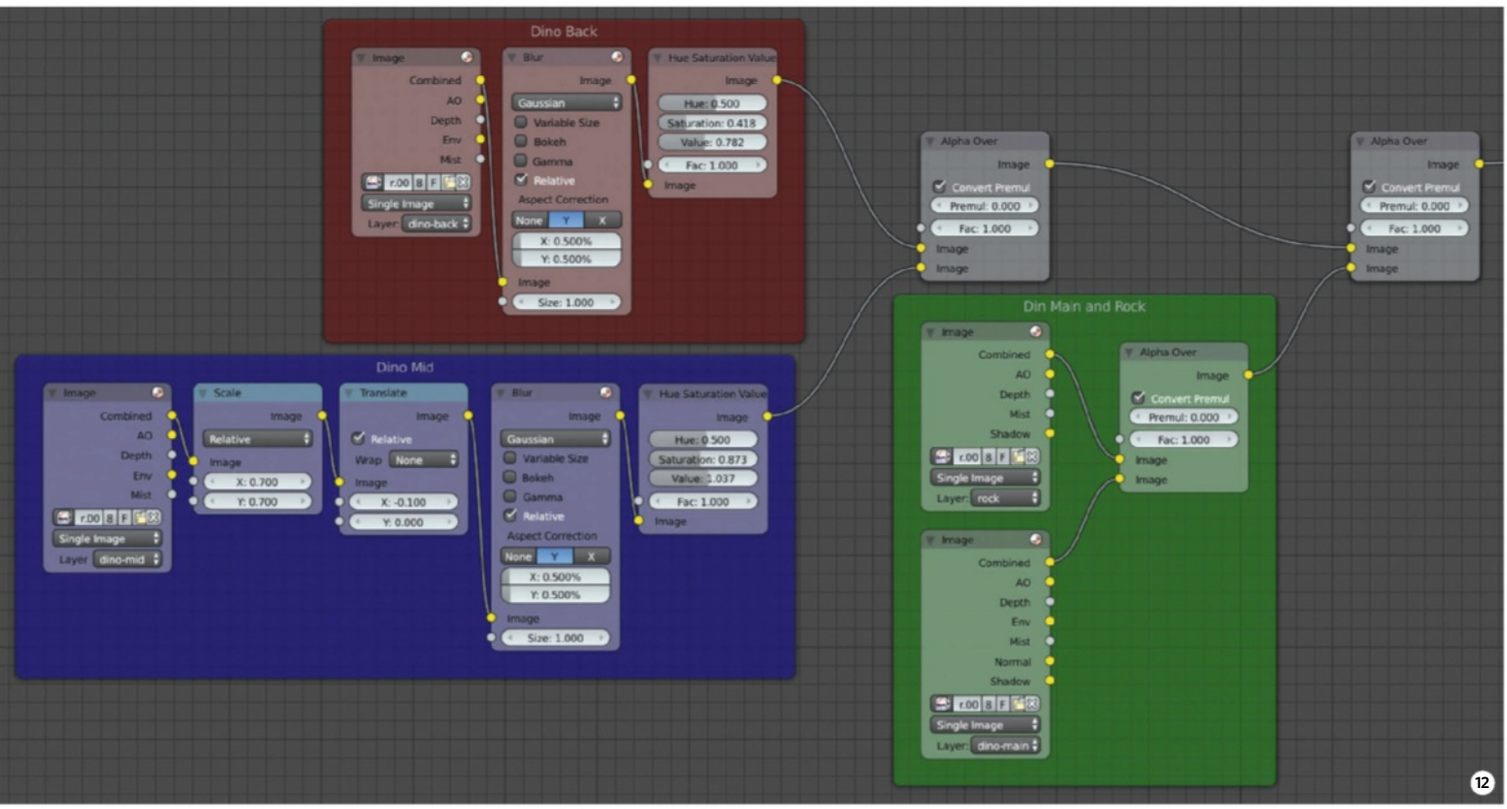
Time for compositing

Start piecing your render layers together

10 Optimise your composite settings After saving the EXR file, create a new .blend file in which we'll do all the compositing. This keeps things orderly and less bloated. Before we begin compositing though, let's adjust a few settings to make the process go faster. First switch to the Compositor and the in Properties panel (N), enable OpenCL, Two Pass, Highlight, and Hide Preview. I also suggest setting the Edit Quality to Low.

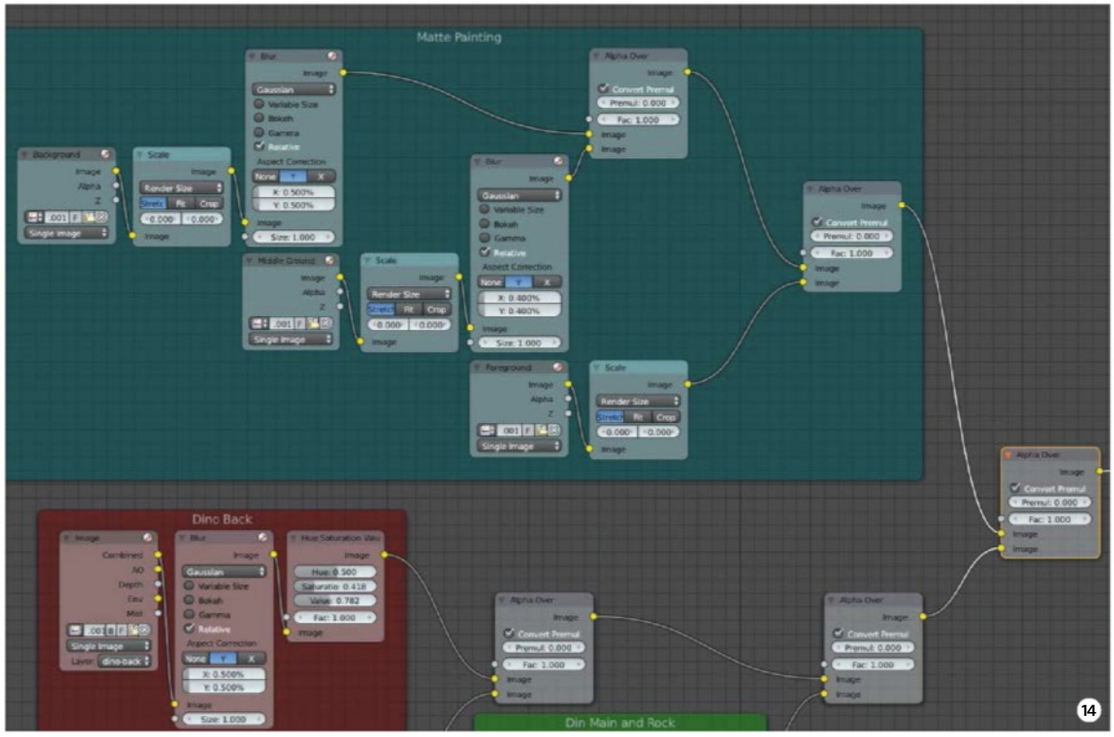
11 Set render size We also need to specify the full render size once again. This can be achieved in the same way as before – from the Dimensions panel in the Render Properties. Setting this size is extremely important as it will define the eventual size of our final composition.





12 Composite render layers To begin the compositing process I like to start with the main layers. This means layering each of the pteranodon instances and the rock. This can be done by using four duplicates of the same image node, set to the EXR we previously saved out. Each node can then specify a different render layer. To combine the layers simply use an Alpha Over node. After this I've also added in some colour adjustment and Transform nodes to tweak the value of position of the background pteranodons.

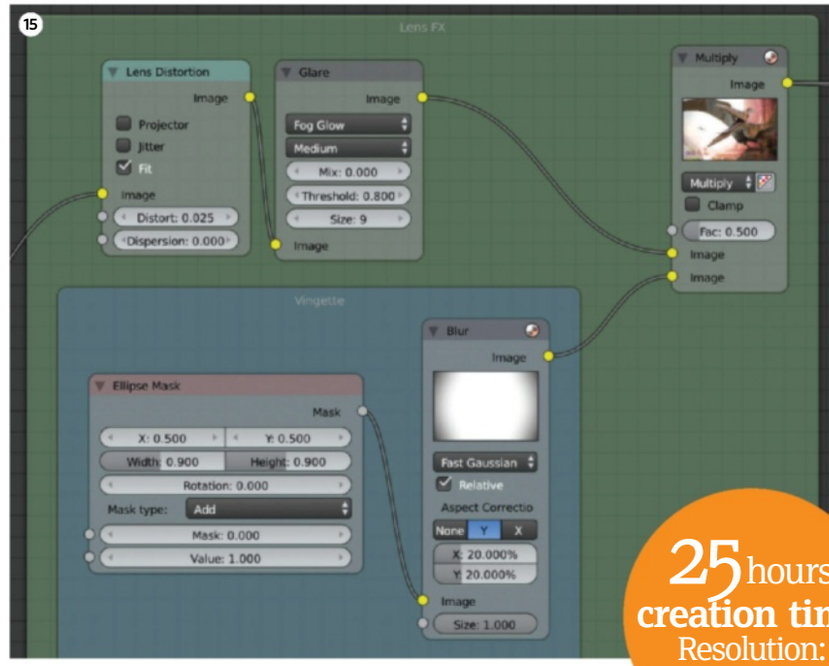
13 Preview the composite At any stage of the compositing process you can check your results easily by clicking on the desired node with Ctrl+LMB. This will automatically connect the node to a Viewer Node. To see the Viewer Node result you can either enable Backdrop or set up a UV/Image editor to display the Viewer Node. It's loaded into memory much like any other image that has been opened.

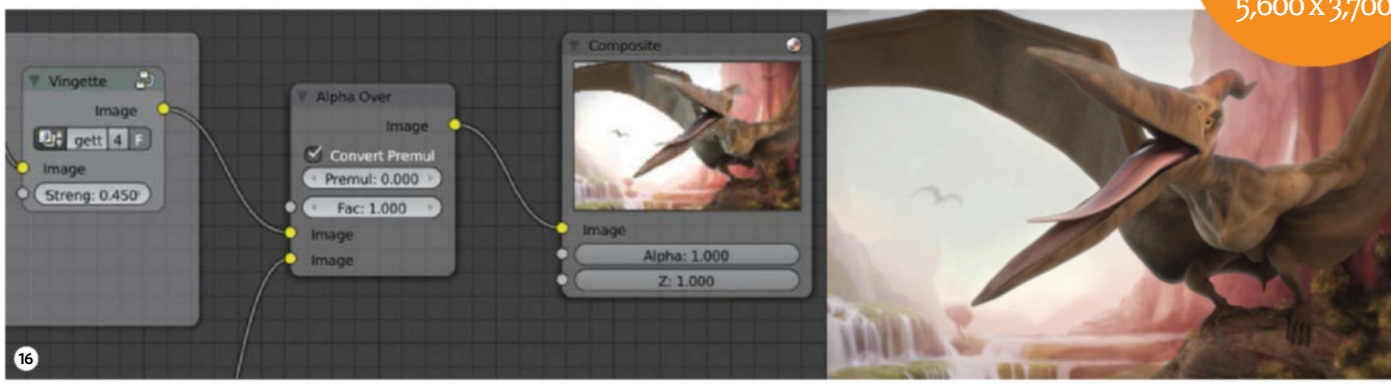


14 Add some background matte layers Now that the main layers are stacked together, let's add in the matte painting. The matte I'm using was created by my team member, Tim Von Rueden, of **conceptcookie.com**. I have prepared the matte in advance by splitting it into background, middleground and foreground. You can find these files supplied with the issue. To make it fit with the final render, use a Scale node, set to Render Size and Stretch. This way it will always conform to whatever your render size is. Add a bit more blur for fine-tuning across the layers. At this point we're mostly done. It's all fine-tuning and adding effects as desired from here.

15 Create some lens effects Two very common Lens effects that we'll add are a slight Lens Distortion with a very light glow and a subtle Vignette. This can be done with just five nodes: Lens Distortion, Glare, Ellipse Mask, Blur and Mix set to Multiply. The key is to keep these effects subtle or else they will feel painfully obvious in the final image.

16 Render the final composite After all of the compositing is done and we're happy with it, it's time to render out the final composite. Depending on the final render size this can be quite fast or quite slow. So as to not lose any image quality, your render size should be set identically to what your rendered the EXR file at. In this case I'm rendering at 1400x925. To render out the final composition just be sure Compositing is enabled in the Post Processing panel of the Render Properties, and be sure your last node is connected to the Output node. Press Render, wait for it to complete and save it to your drive. If you look at the final composite file on the disc, you'll see I've taken the compositing a lot further, adding some additional layers, colour adjustments and so on. You also notice I've made use of a lot of Node groups to keep a clean node setup. Take a look and see if you can break it all down. That's it for this tutorial series, thanks for reading!





I made this...

Incredible 3D artists take us behind their artwork

Artist info

Anders Ehrenborg

Website www.andersehrenborg.com
Country New Zealand
Software used 3ds Max, V-Ray, Hair Farm, ZBrush, LightWave, Photoshop, MARI
Bio Anders is a self-taught artist from Sweden, living in New Zealand

> The tear line above the lower lid, highlights in the tear duct; things like this help add realism to an image. However, don't forget the big shapes that those details are resting on. It's the overall feeling of the final image that really counts

Bear King 2013

I've been stuck doing cartoon work for the last few years and wanted to create something completely different. I didn't have a clear plan when I first started working on this, all I knew was that I wanted to try to create a realistic character bust. The character then evolved over time. LightWave was used for base meshes, ZBrush for all sculpting, Hair Farm for all hair and fur, 3ds Max and V-Ray for the lighting and render, then Photoshop and MARI for the textures.

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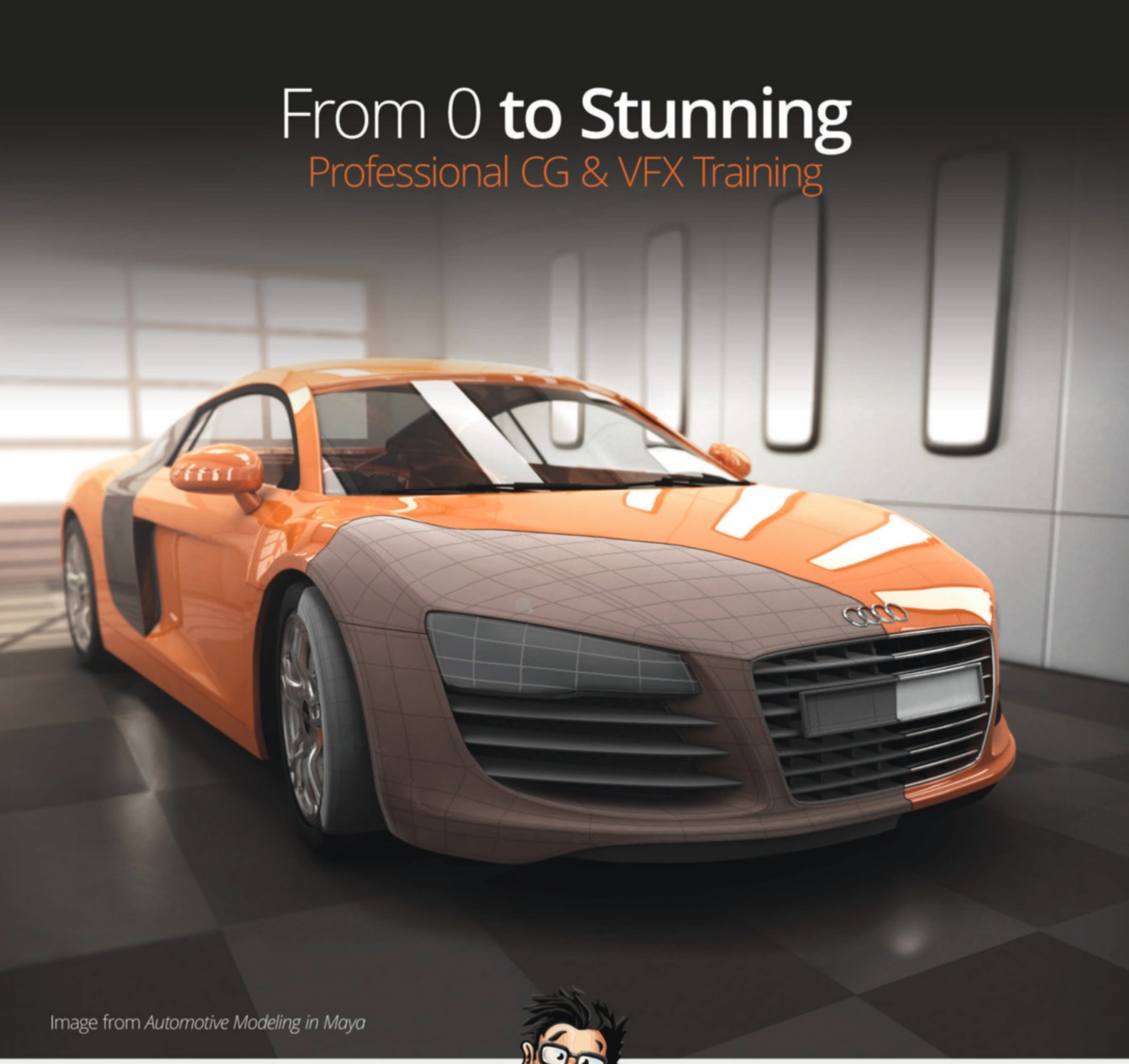

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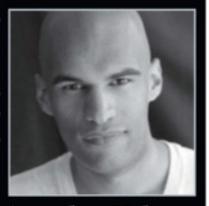
Step by step

Easy-to-follow guides take you from concept to the final render

Artist info



Christopher Velez

3DArtistonline

Username: Polydude

Personal portfolio site www.nethub.cghub.com

Country LA, United States

Software used Maya, V-Ray, Photoshop

Expertise Photoreal and stylised character creation

Mesh shatter your characters

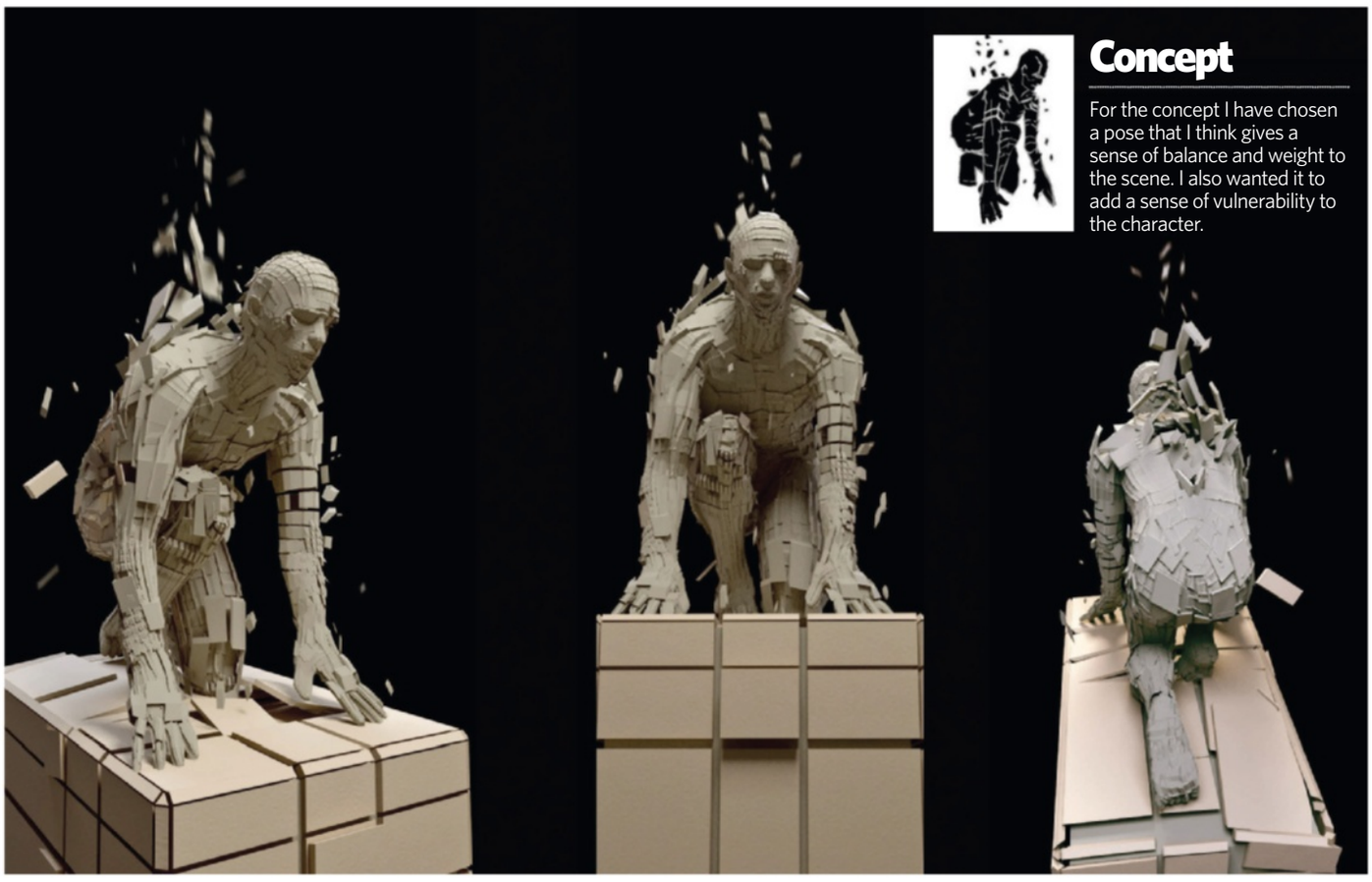
Polyman 2013

"The goal was to create an abstract character constructed from various pieces of geometry. The image illustrates vulnerability"

Christopher Velez spends his time improving his skills as a graphic designer. He also performs theatrical acting on the side

I have always enjoyed looking at sculptures, especially puzzle and junk sculptures that are assembled from many parts. This inspired me to find a quick solution to achieving something similar in 3D. So, I am excited to share with you a technique that I use in some of my abstract digital sculptures, which I like to refer to as mesh shattering.

In this tutorial I will take you through a step-by-step process for creating a mesh shattered surface using my Polyman character. You'll learn different concepts from mesh shattering a surface to a few post-production tips and tricks. First we'll discuss how topology will influence the surface of your model. Then we'll cover the peeling away of certain areas of our character, exposing different layers underneath. We continue by manipulating some of the geometry on our character to help convey randomness and imperfection. We will then focus on the vacuum effect that is happening on Polyman's back, by manipulating floating pieces of geometry. Finally, we cover the rendering and post-production process.



Concept

For the concept I have chosen a pose that I think gives a sense of balance and weight to the scene. I also wanted it to add a sense of vulnerability to the character.

Learn how to

- ☑ Take a posed character and shatter the surface
- ☑ Add thickness to each piece of geometry
- ☑ Discover methods of adding a peeling effect to the character's arms and back
- ☑ Create layers underneath the surface for depth
- ☑ Manipulate the surface for a randomised look
- ☑ Prepare scene for rendering
- ☑ Implement a few compositing techniques for your final rendered image

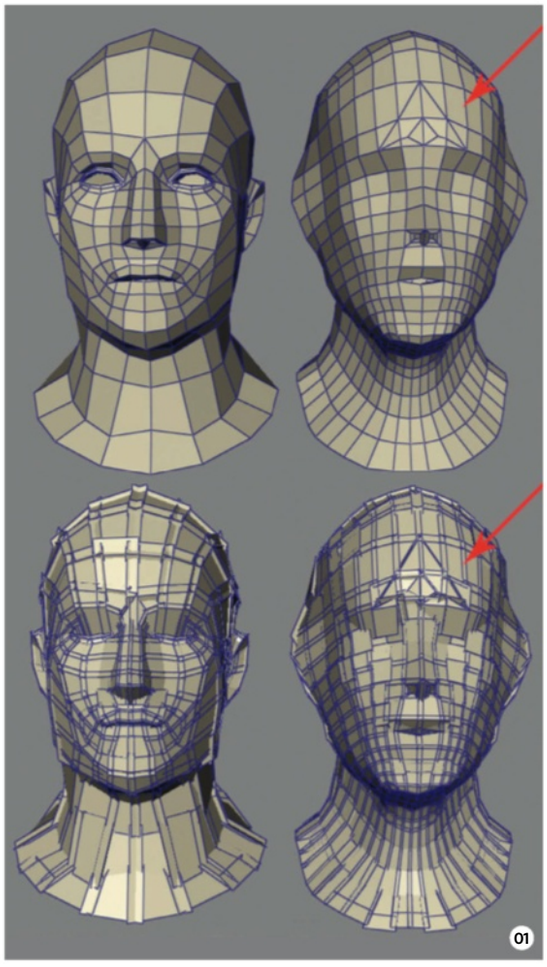
With the Disc

Tutorial files:

- Scene files for Polyman
- Tutorial screenshots
- Two video tutorials showing the workflow in Maya, Max, and Blender

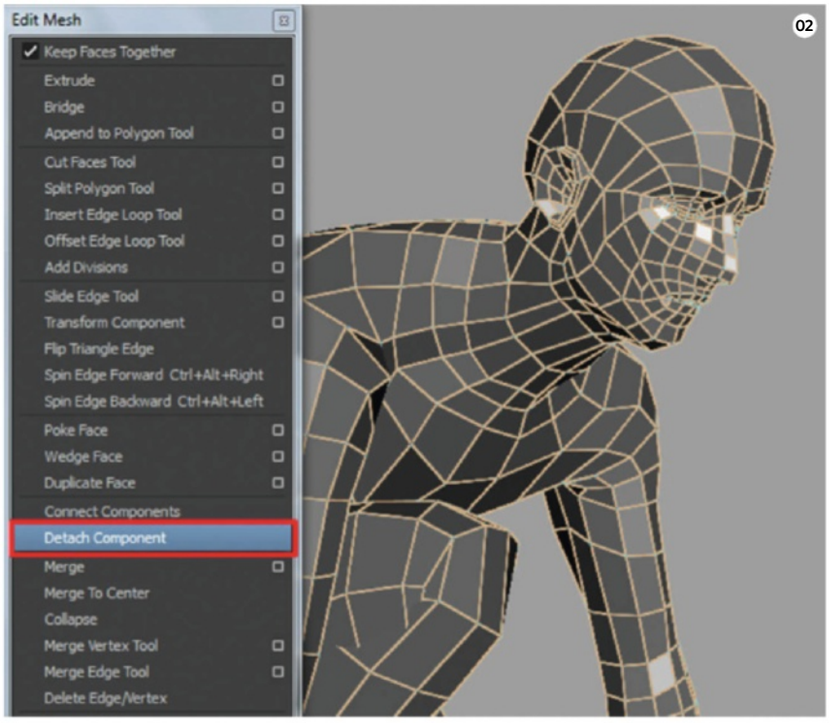
Getting started

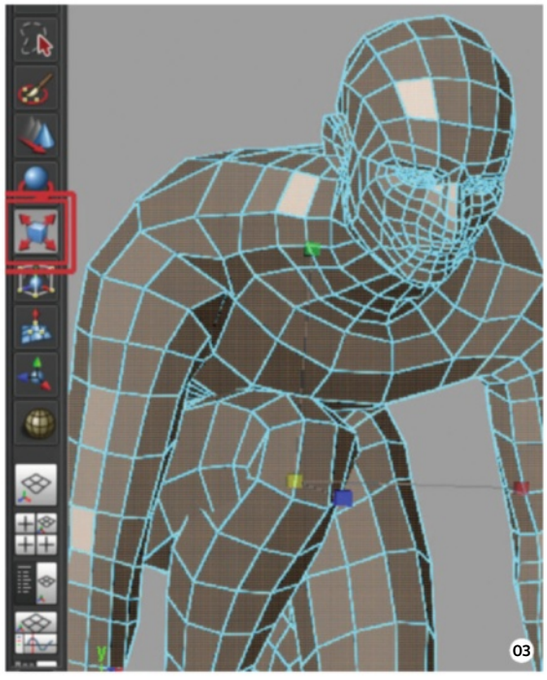
Focus on topology flow



01 Observe the geometry We begin by taking a close look at how topology can affect the overall appearance of your character. In the top left-hand portion of the accompanying image, you'll notice a general face mesh with edge loops defining the facial features: eyes, nose and mouth. On the top right-hand side, we have another example but with edge loops that have simple cross sections. Also notice the triangle shape I added on the forehead to demonstrate how topology will transfer over in the end. The bottom row is the result after using the topology technique, revealing how edge loops define the flow of geometry.

02 Model setup and detach edges Let's jump right into making a mesh shattered model. For this tutorial we'll be using the Polyman scene that's provided on the disc. Import the scene file called Start into Maya, and hide the platform on a separate layer so the only thing visible is the base mesh. Now switch to component mode and select all the edges that make up the model. In your modelling menu click on Edit Mesh>Detach Component to detach all the selected edges, then Mesh>Separate, forcing each face to split apart.





Adding extra surface detail

While detaching and performing face extrusions, I suggest your model polycount be just under 7k. You'll notice that performing an extrusion on thousands of separate pieces of geometry can be computationally expensive and may even crash Maya. However there are always workaround solutions. If you want to use a model with a higher density such as 7k or above, just split the model into smaller parts and tackle each section one at a time. For extra surface detail, layering a denser model on top of a lower density model will add a cool randomised look. We'll cover randomising fully later in the tutorial.

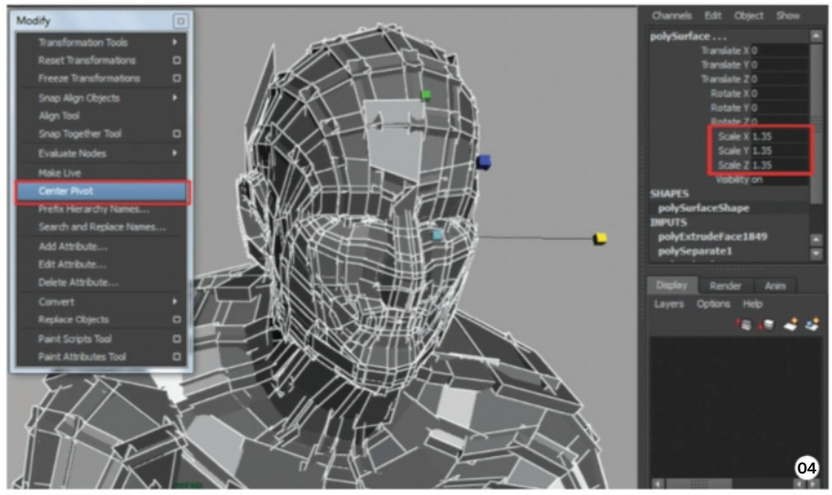
03 Add thickness Now that we have all of the faces separated, we are able to focus on adding thickness to each face for an improved appearance. Adding thickness creates a better visual sense of angle and direction. Start by selecting the individual faces that make up our model and then select Extrude from the Edit Mesh menu. Once the extrude manipulator appears, select the standard Scale manipulator and begin to scale inwards until the desired thickness is achieved. There are undoubtedly other ways of adding thickness, but this method often delivers the most interesting results in my opinion.

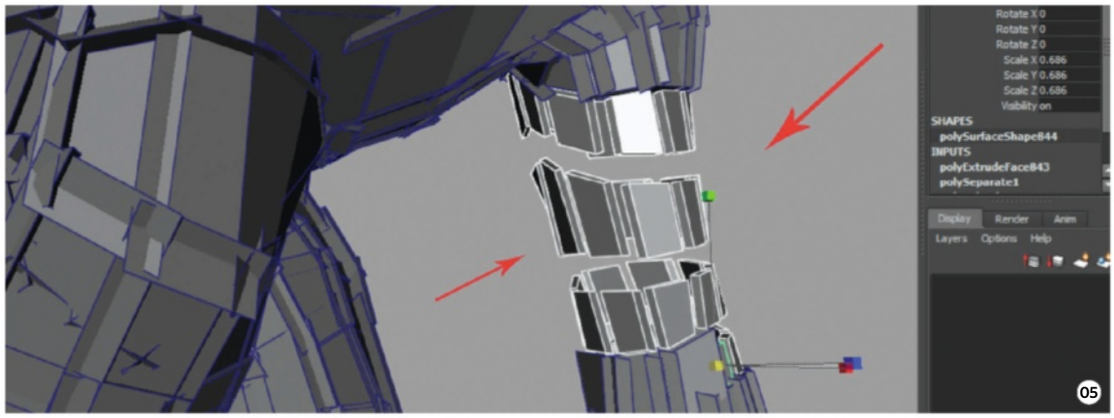
Mesh shatter and peeling

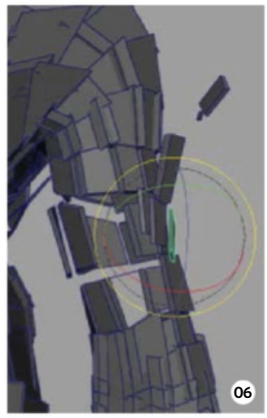
Start adding the details to your model

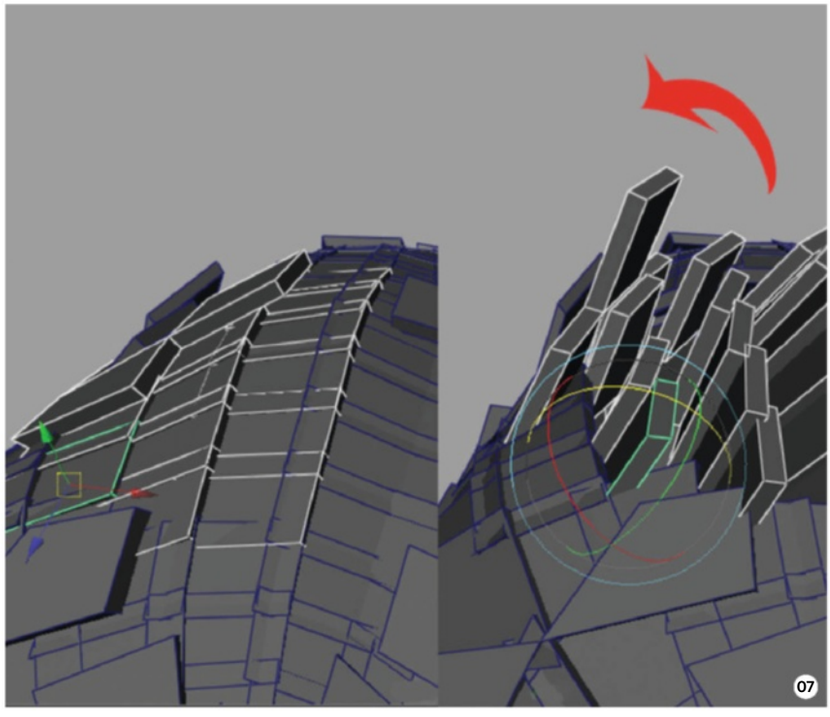
04 Scale for a shatter effect Select the entire model again by going to Modify menu>Center Pivot. This ensures each individual piece of geometry is scaled locally. Select and scale the entire model outwards and immediately notice the results; the topology begins to shatter. We need to find a balance between the shatter effect and the model's facial features, so set the scale XYZ to a value of 1.35 in the channel box.

05 Randomise the surface This is where the fun begins. We start by taking a creative approach towards how the surface of the model will look. In the screenshot provided I began working on the model's left upper arm. Select several pieces of geometry with the Lasso tool, then scale the selection down so it starts to look like floating cubes. Set the scale XYZ to a value of .68 in the channel box. The goal here is to create a sense of wear and tear on certain parts of the body. Try scaling your selection in the opposite direction too.







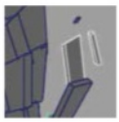


06 Add Layers Let's continue with the model's left arm as we start adding layers to our damaged section. Duplicate some of the cubes made earlier and move them out so they cover up parts of the damaged section. Scale and rotate the new geometry so they have randomness; repeat these steps on other areas where you've added wear and tear. This helps create a sense of depth and complexity to the surface.

07 Create a peeling effect Add peeling to make it seem as if the character is being pulled into a vacuum above. Start on the back, where we will have the most damage. Select one half of the back with the Lasso tool, then rotate the selection away from the centre of the back. Do the same for the other half of the back so you have a pried-open look.

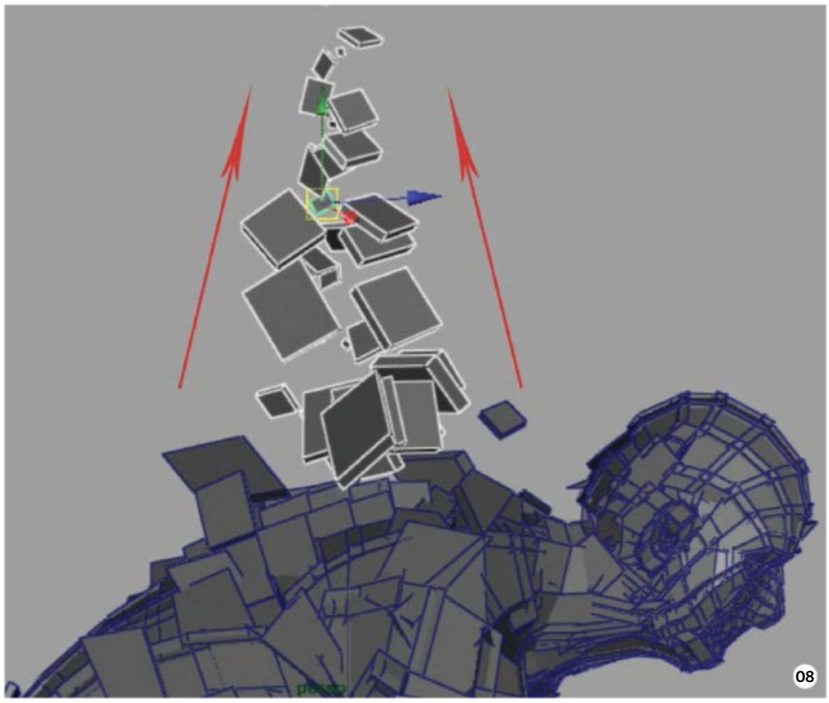
More on randomising

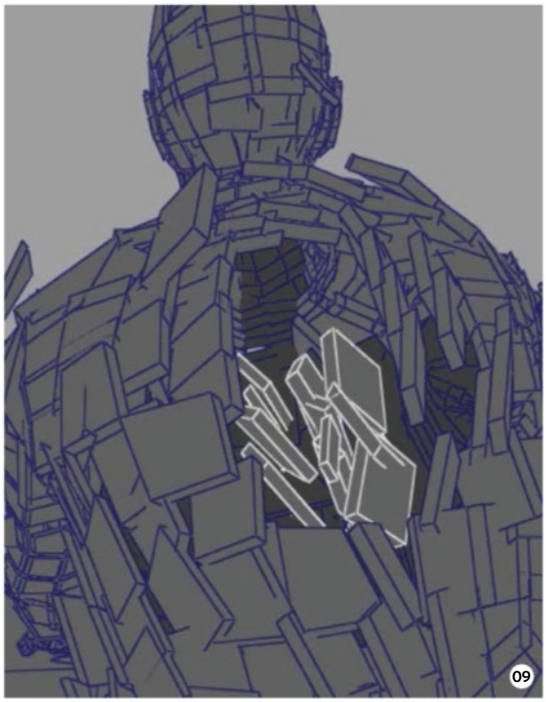
For Polyman's face, I preserved the features by scaling down some of the geometry to add clarity to the eyes, nose, and lips. I also deleted geometry that was obtrusive to the model while rearranging other pieces around. By adding a sense of randomness, your model helps break the CG look of appearing too perfect. No matter how abstract your art can be, adding a bit of imperfection will make your scene look more aesthetically pleasing to the viewer.



Finalising the model

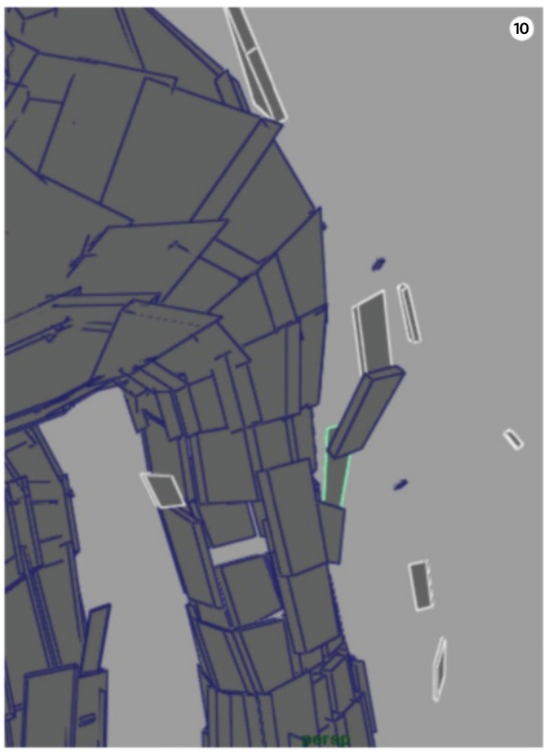
Add some finishing touches to the scene

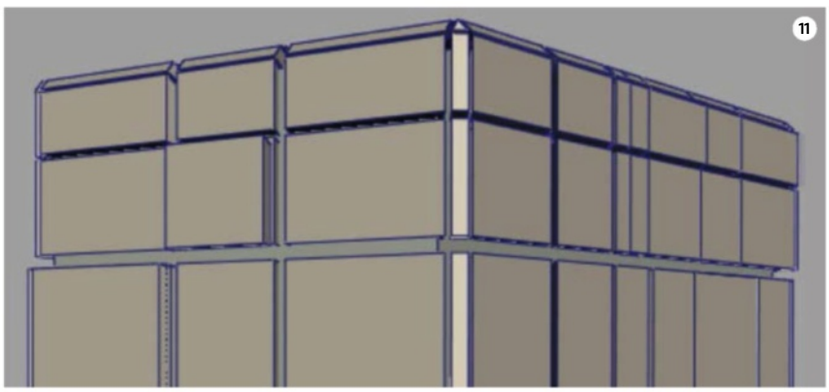




08 Create a vacuum effect Now we're almost done with our model, it's time to add floating pieces of geometry above Polyman's back. Start by selecting some of the geometry we peeled back in the previous step and make duplicates. Move the new geometry up so they float just above the back of our model. Do the same for the other side. Continue building up on the floating pieces so that you form a pyramid shape. Make sure you randomise the floating pieces by scaling, moving, and rotating each piece.

09 Fill empty spaces To finish, we'll cave in the centre of our model's back by selecting the back's centre and moving the various pieces down inside the model. Next, scale your selection down so that it's smaller, creating the appearance of floating debris inside the hole. You can apply this to other hollow areas of your model.





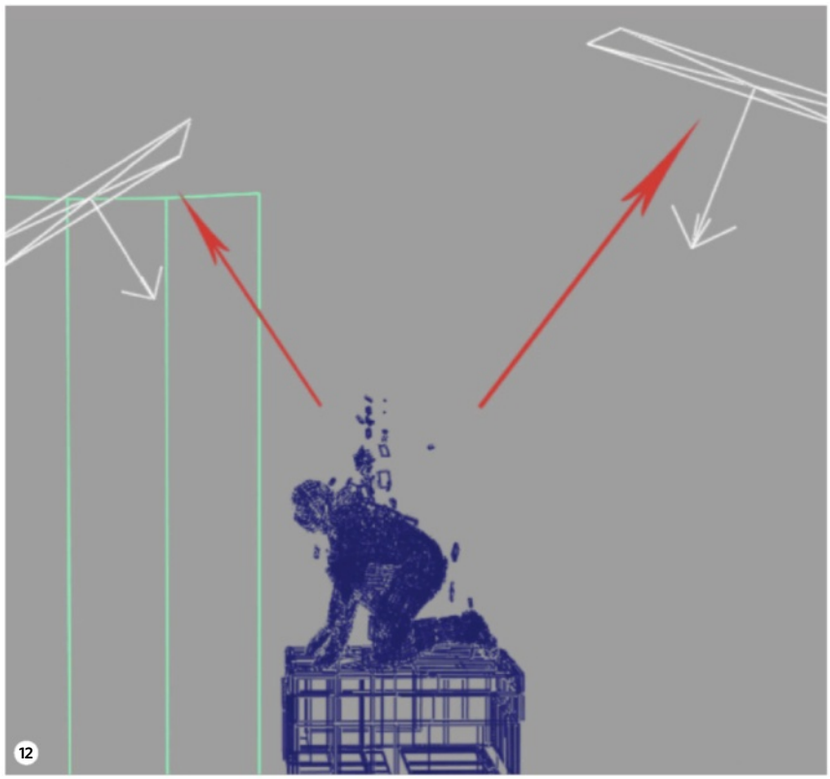
10 Generate floating debris Now we will focus on the final part of the modelling process. Add some debris to the scene by selecting areas of the model that are damaged. In this case we'll focus on the arm again. Select a few random pieces and duplicate them. Begin to move the pieces around the damaged area and make sure you randomise the rotation of each piece of debris. Remember that rotating debris in the direction of the vacuum will help give the image a better sense of direction and momentum.

11 Mesh shatter the platform As for the platform upon which Polyman sits, I added a bevel to the edges and performed the same steps covered in the first part of the tutorial. I scaled down the geometry so the pieces appear evenly spaced like tiles. I also added a cube inside the pieces of geometry to make the platform appear solid. The platform was made small so that it accommodates Polyman's body, but it still adds to the scene's sense of vulnerability.

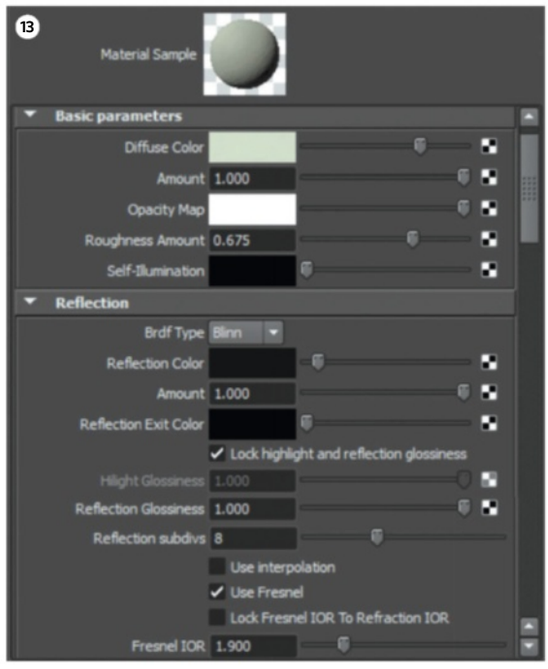
Render and post

Set up your render and head into post

12 Set up your lights Now that the model is complete, we can start setting up the lights for the scene. I used V-Ray for this scene but you can replicate it with a similar setup in other render engines. I added two area lights; one in the front and a rim light in the back. The first light has a light-grey colour with an intensity value of 20. The second light has a sky-blue colour with an intensity value of 16. I tend to keep the lights at a far distance, as I find that adding distance to my lights yield better results for the shading in my scene.



13 Material settings As for the materials, I wanted the surface to resemble something fragile yet sturdy, such as pottery. The same applies to the tiles on the platform. Assigning a new material may cause a bit of memory lag depending on how much geometry is in the scene. Set the material colour to a light grey and Roughness Amount to .675. Set the reflection to Blinn and the Reflect Color to dark grey. The Use Fresnel checkbox should be checked and the Lock Fresnel IOR... should be unchecked. Change the Fresnel IOR slider to something high like 1.9. The same settings can be used for the platform material too.



Artist Showcase

Christopher Velez

I was born in Brooklyn, New York, but in 2009 I moved to California. Art has always been a passion of mine. I channel my creative energies into digital art where I have limitless freedom to manifest my ideas into reality. I'm a freelance digital artist with a focus on character modelling and I also do theatrical work as an actor on the side.

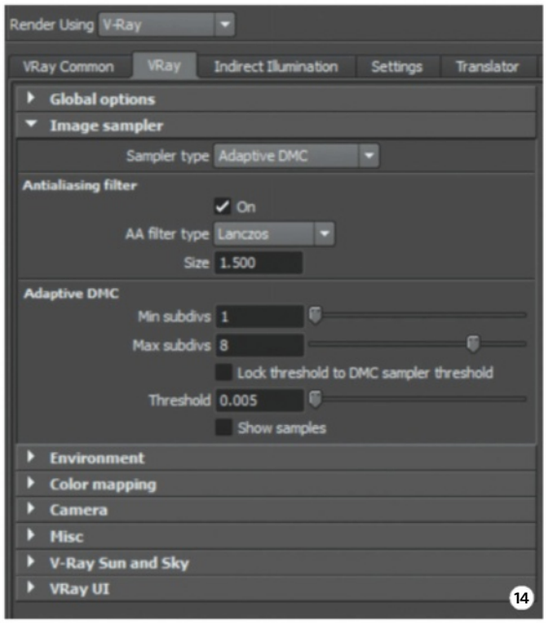
Married to Technology **Maya (2013)**
This particular character is based in the future, where cybernetic modifications are mainstream. In this narrative, she has a cybernetic implant addiction.

Persian Princess **Maya (2013)**
This simple face study shows that Christopher's work isn't just based on abstract works, but also on realistic and believable models.

Z Moments **Maya (2013)**
Z Moments are a series of sculpts based on characters from the popular animated series, *Dragon Ball*.

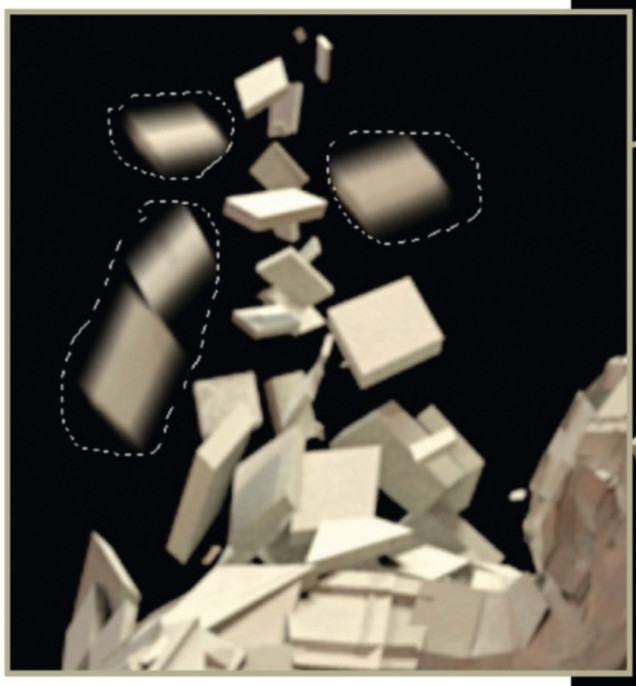
Head into postproduction

Touch up your model for a clean final result



14 Render settings Let's take a look at the primary settings I use for my renders. I have provided detailed screenshots of my settings with the disc. Start by selecting the V-Ray tab. Sampler type is set to Adaptive DMC; Antialiasing is set to Lanczos for sharper details; Adaptive DMC is set to 1 min and 8 max; Threshold is .005. Next we move onto the Indirect Illumination tab. Turn on Ambient Occlusion; set the Primary bounce to Irradiance Map and Secondary Bounce to Light Cache. I didn't use any render passes, but V-Ray makes it very easy to set up render passes if you choose to use them.

15 Final touch ups Head into Photoshop for some final touch ups. First add some Motion Blur to the floating debris. Use the Lasso tool to make selections around several floating pieces of debris, then apply Filter>Blur>Motion Blur. Set the angle to -81 for an almost vertical blur and a Distance to 17 pixels. I like to randomise the blur in the image; some floating parts were blurred and some were not, just to give the appearance of random velocities. For more on touch ups, see the boxout at the bottom of the page.



More on touch ups

Here are some extra steps I take in Photoshop. I like to pump up the contrast a bit by going to Image> Adjustments>Shadows and Highlights, and set the Shadows Amount down to 17% and the Adjustments Midtone to +5. I add a bump map to the overall image by duplicating my main image, going to Filter>Other> Highpass and setting the Radius to 4 Pixels, then changing Layer Type of the Highpass layer to Soft Light. Reduce the Opacity of the Highpass Layer down to 30%.

• **DID YOU KNOW?** • All tutorial files can also be downloaded from: www.3dartistonline.com/files

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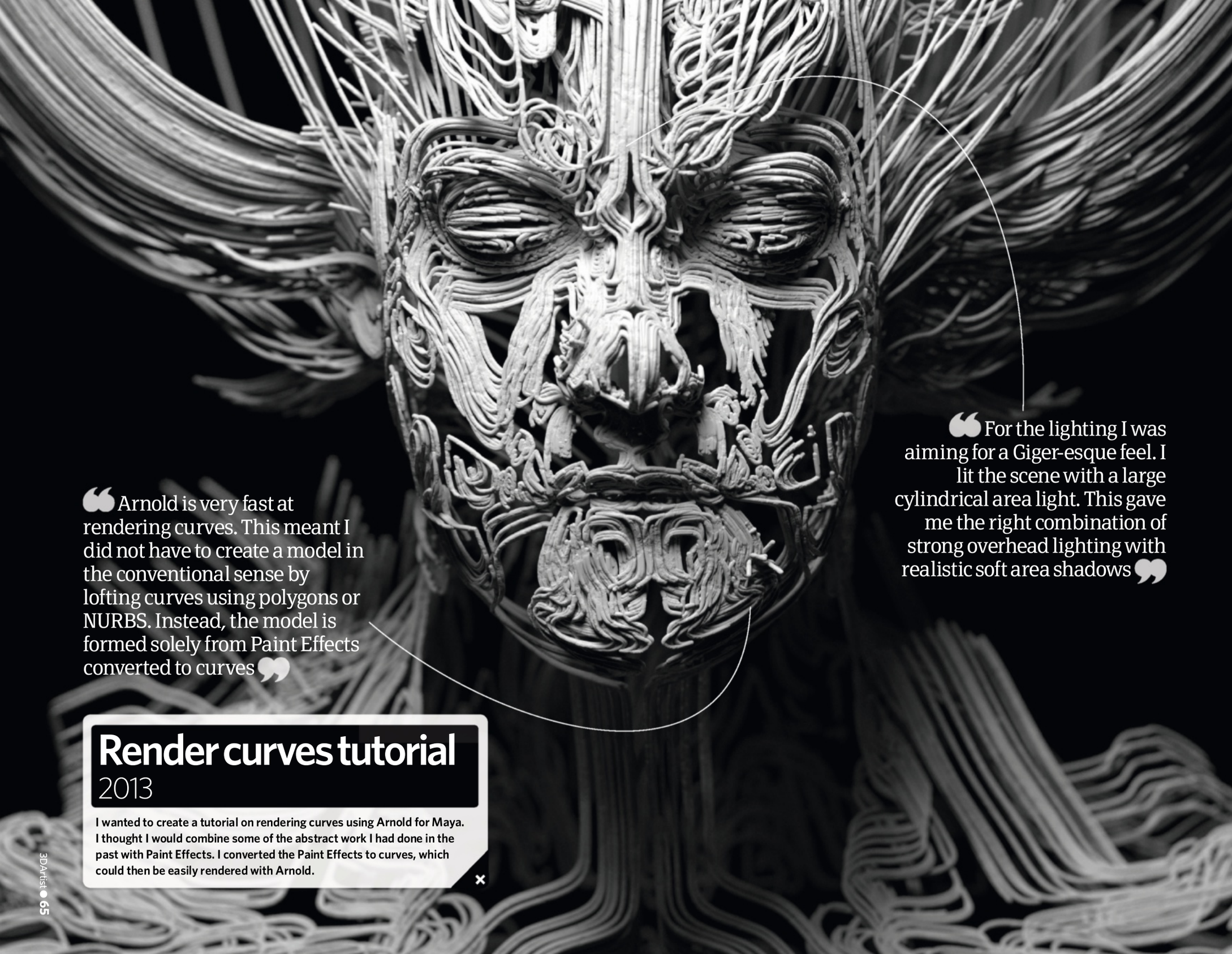
Artist info

Lee Griggs

Website www.leegriggs.com, https://support.solidangle.com
Country Spain
Software used Maya, Arnold
Bio Lee works for Solid Angle, where he creates documentation and tutorials for Arnold



“Arnold is very fast at rendering curves. This meant I did not have to create a model in the conventional sense by lofting curves using polygons or NURBS. Instead, the model is formed solely from Paint Effects converted to curves”

“For the lighting I was aiming for a Giger-esque feel. I lit the scene with a large cylindrical area light. This gave me the right combination of strong overhead lighting with realistic soft area shadows”

Render curves tutorial
2013

I wanted to create a tutorial on rendering curves using Arnold for Maya. I thought I would combine some of the abstract work I had done in the past with Paint Effects. I converted the Paint Effects to curves, which could then be easily rendered with Arnold.

With the Disc

Tutorial files:

- Various scene files including MAX project files
- Tutorial screenshots

Learn how to

- ☑ Both pre-fracture and prepare a CG character for particle work
- ☑ Lock a particle system to a moving object/character
- ☑ Trigger fragments to change events by objects
- ☑ Optimisation of mParticles for speed and accuracy

Concept

In this tutorial we are going to shatter a pre-fragmented character by geometry using mParticles and a little ADM (Advanced Data Manipulation) in 3ds Max 2014

Step by step

Easy-to-follow guides take you from concept to the final render

Artist info

Anselm von Seherr-Thoss

3DArtistonline

Username: 3delicious

Personal portfolio site www.incendii.com

Country USA

Software used 3ds Max 2014, RayFire (optional)

Expertise Anselm has worked on VFX for the likes of *Avatar* and *Star Trek: Into Darkness*

Shatter a moving character

Ice Man Shatter 2013

> Here we're going to animate a fractured character, as if they are made of something brittle, using hand-animated control objects

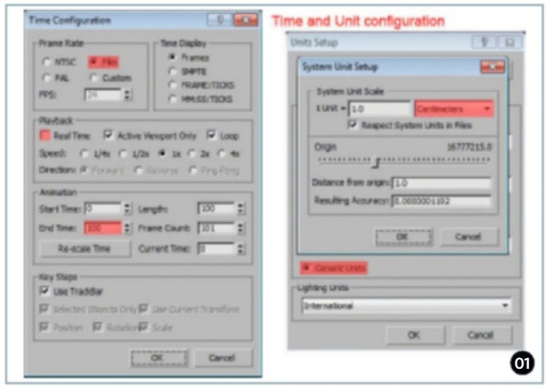
Anselm von Seherr-Thoss is an award-winning VFX TD and VES (Visual Effects Society) member

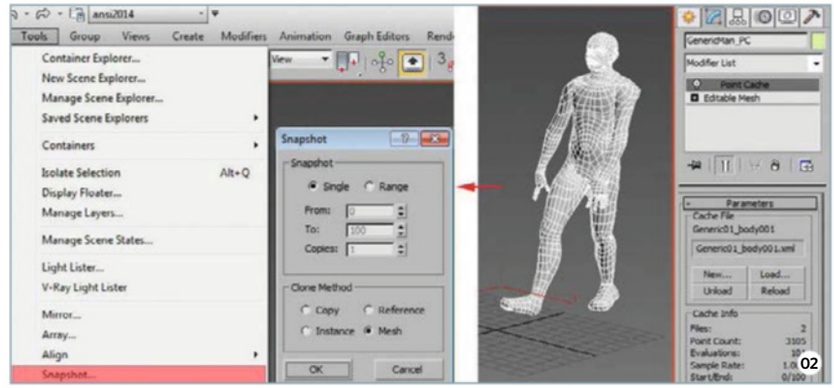
Here you will be learning how to pre-fragment a character using 3ds Max and RayFire. We will then pipe the fragments into mParticles and lock them to the original moving character. Based on hand-placed geometry objects we will then release these fragments over time creating the effect of a crumble while the character is walking. This effect was used in a Gazprom commercial where a fast running group of horses shatters: tinyurl.com/3DAGazprom.

You will also learn basic ADM (Advanced Data Manipulation), which is the former PFlow Toolbox#3. Furthermore you will learn how to optimise your mParticles flows and prevent a major PhysXplosion, which is caused by intersecting geometry.

Prep work

We need to fragment and prepare our character before we pipe it into PFlow





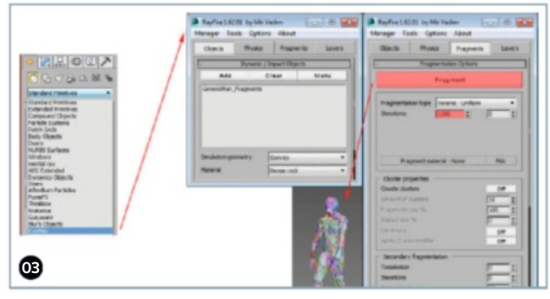
01 Ensure the scene is set This initial step is small but important. Make sure your scene is in Film/24fps and 100-130 frames long. Also make sure Realtime is unchecked, as mParticles playback will be affected by that. Finally, make sure your units are Generic and Centimeters. Units will have an effect on the overall speed and look of things.

02 Check the provided character The initial scene provided has a character with a PointCache modifier in it. Re-link the point cache to the file provided, then make a snapshot since we want to keep the original walking character as the driver for our fragment. Overall it's always a good idea to make a copy of your original object and put it on another layer.

03 Fragment the snapshot with RayFire Select the snapshot and start RayFire. If you don't have RayFire open the second step as a MAX file, you will find the character already broken up in there. In RayFire load the character into the Impact Object group and open the Fragmentation tab. Choose Voronoi Uniform as the Fragmentation Type and around 1,500 fragments, then hit the Fragment button. Your result should look like the thumbnail in the screenshot.

Conform meshes for particles

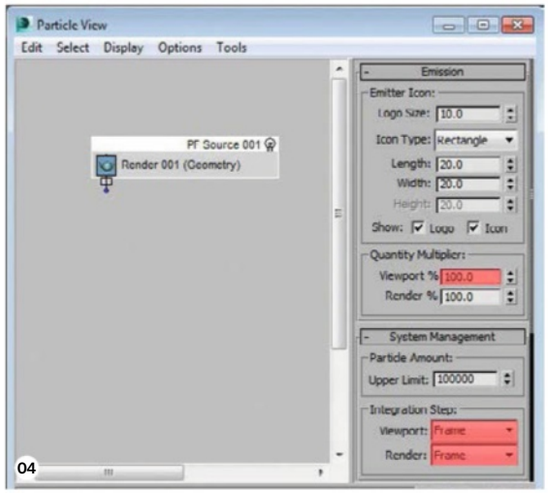
Once you have the fragments there is one last important step before we can make those particles! The fragment pivots need to be central and the Xform should be reset. Once that's done you can convert them all to meshes. The pivot centre of each fragment will be the particle pivot. EditMeshes carry less data then EditPolys and are therefore faster, so they should be your preferred mesh choice when working with particles.

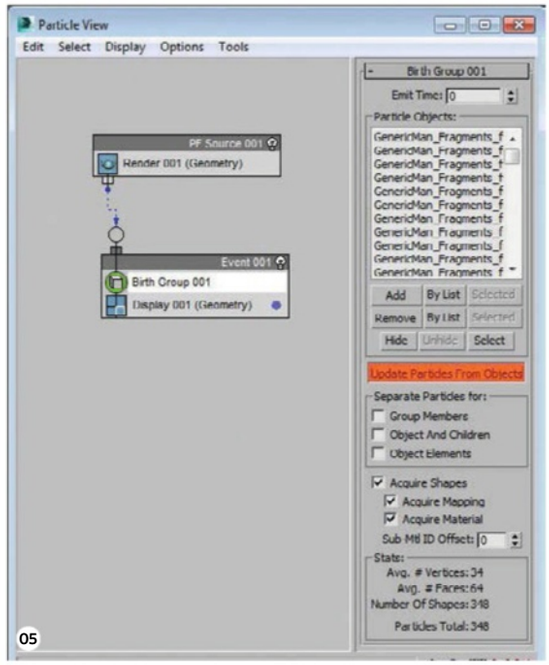


Head into PFlow

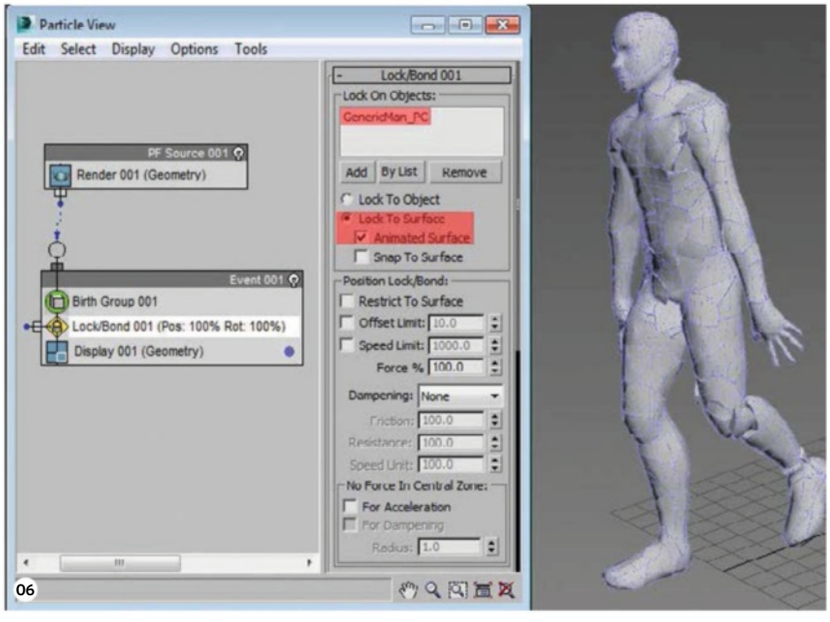
Pipe the fragments into PFlow and set up mParticles

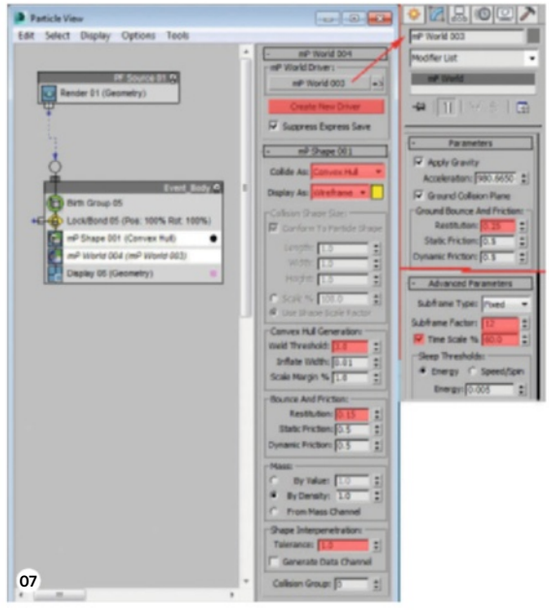
04 Create the PFlow It's now time to set up the PFlow for the character and fragmentation effects. Hit 6 on your keyboard to open the Particle View. From the depot drag an Empty Flow into the view. Make sure you see 100 per cent of your particles in the viewport and that the Sub-Sampling is set to Frames. Our character is moving fairly slow in the provided example, so in this case we don't need require a huge amount of precision.





05 Bring in the fragments Add a Birth Group from the depot and connect it to the root event. Add all your fragments into the Birth group and hit Update Particles from Objects. This will make every fragment a particle and will also inherit shaders and mapping. When you set your Display Node to Geometry you should see the fragments as particles.





06 Lock the particles to the moving character When you scrub the timeline you will notice that the particles are just standing there. In order to make it move like the original character we need to unhide it again and in the PFlow create a Lock/Bond test. Pick the character as Lock On Object. Set it to Lock To Surface and Animated Surface. Now scrub and the shapes should somewhat follow the character's walking motion.

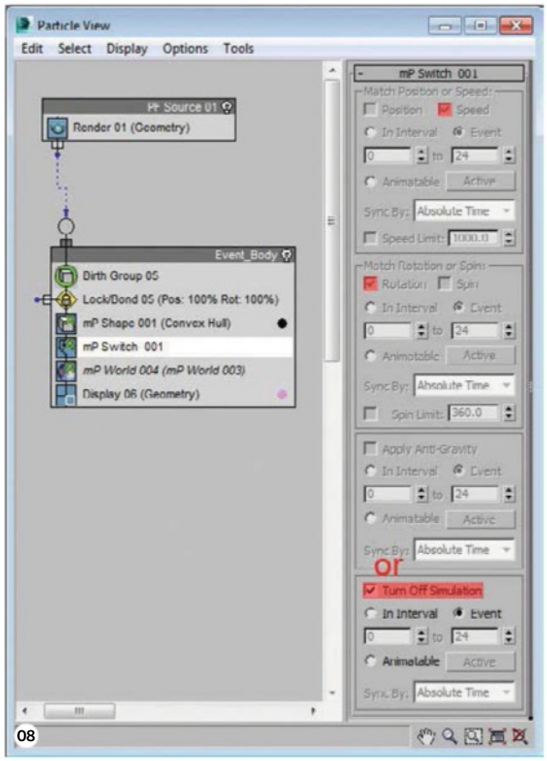
07 Get physical In order for mParticles to work we need an mpWorld and an mpShape. Drag an mpWorld operator into the flow and hit Create New Driver. This will add a helper in the world centre called mParticle World. Make sure this has Ground Collision and Gravity active. Next make an mpShape, which will make every particle a PhysX shape that can collide with other shapes. Adjust this to Convex Hull and set the Display to Wireframe. You can see that some shapes will overlap due to the Convex nature of the shape. We can counteract this by adjusting the Weld Threshold value and Interpenetration tolerance (see Avoid PhysXplosion).

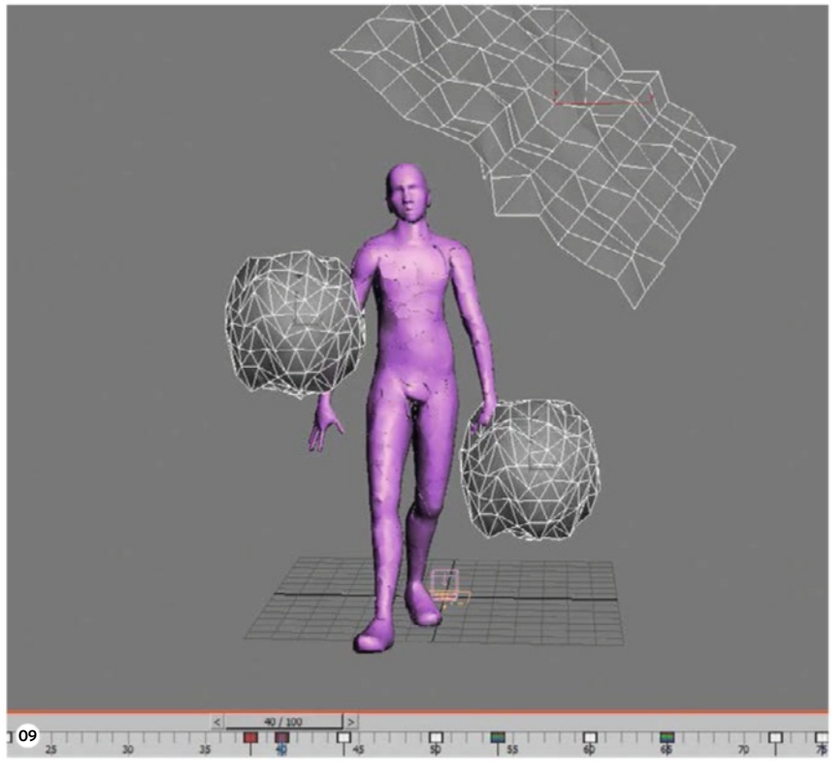
Avoid PhysXplosion

When you scrub the timeline you will see that the particles just fall down and some might bounce out of the shape. This is because there is potential shape interpenetration. The engine tries to separate those shapes causing an explosive motion, so to counteract this it's important to play with the Weld Threshold and Interpenetration Tolerance in the mpShape and the Sub Samples in the mpWorld. Lower Restitution and Friction values can cure the spasms. It's up to you to find the best working path depending on what look you are after.

Create trigger geometry

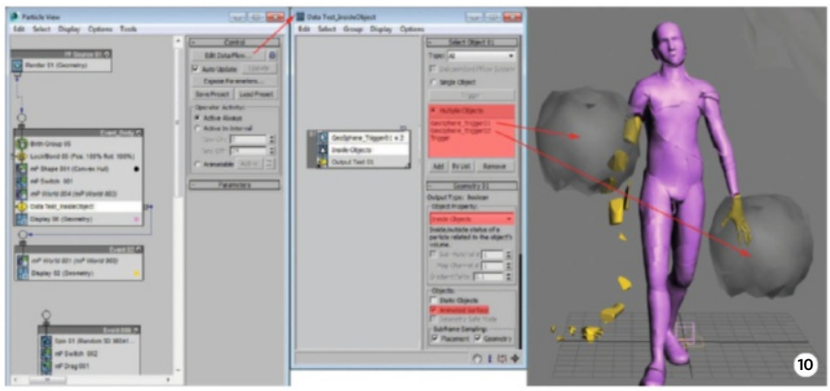
Make mpShapes obey the Lock/Bond and trigger fragmentation



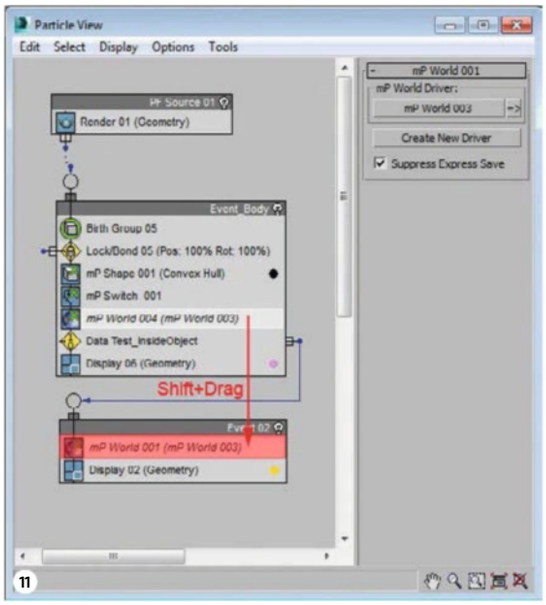


08 Turn off PhysX features Drag an mpSwitch under mpShape and check Speed and Rotation to match and follow legacy operators. This will keep them in place despite the Lock/Bond operator telling them otherwise. Or, you can check Turn Off Simulation and PhysX will be turned off and will kick in when told to. This can result in explosive behaviours, but it is faster.

09 Create the trigger geometry We want the fragments to fall eventually, so an easy way is to include geometry that surrounds the particles at some point and triggers an event change when they are inside the trigger object. For this I just hand-animated two spheres that trigger the arms and a plane that triggers the remainder top down. You can alter the timing as you like using your own geometry; just make sure it surrounds the particles you want to trigger.



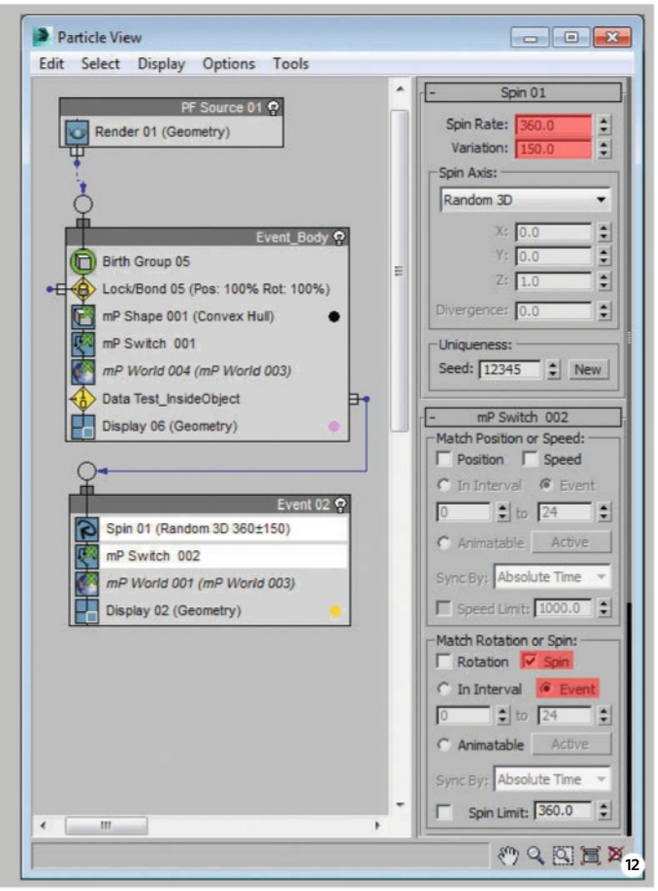
10 ADM inside object trigger Data Test This the only time we are going to utilise ADM. Add a Data Test under the mpWorld, then open the Data view and drag a Select Object sub-operator into the view. You need this OP every time you want to select something from your scene. Add all your trigger geometry, then drag a geometry sub-operator into the view and connect it. Your trigger objects are geometry, so this is the OP of choice. Set it to Inside Object and this will test if a particle is inside the objects or not. Create an Output Test into the view and connect it.



11 The second event of free-fall Now that you have a Test operator to send particles into a new event with new rules you can design the free-fall part of the effect. Select the mpWorld, hold down the Shift key, then drag it down under the PFlow event. This will prompt you if you want to copy or instance the operator – pick either one. The mpWorld helper is the box object in the viewport and only references this operator. Now you should have a second Display operator as well, so pick a distinguishable colour from the first event.

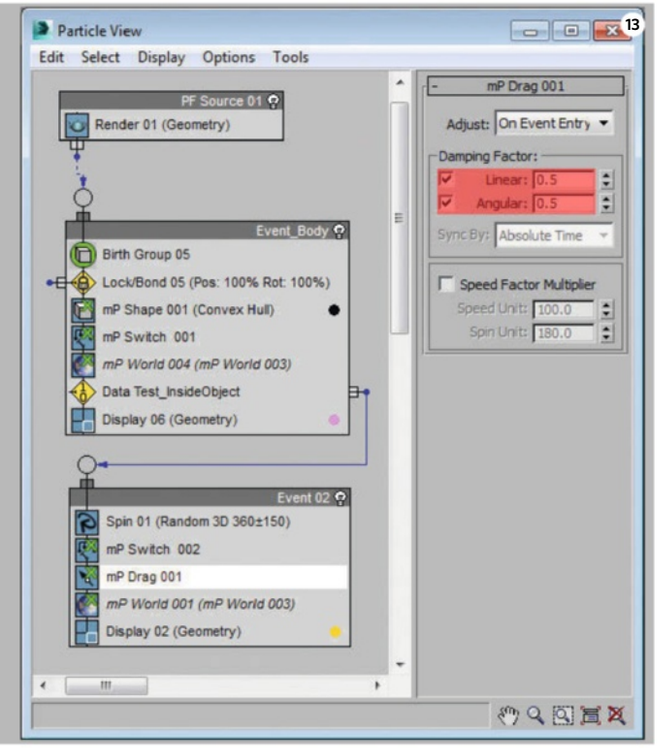
Optimise the flow

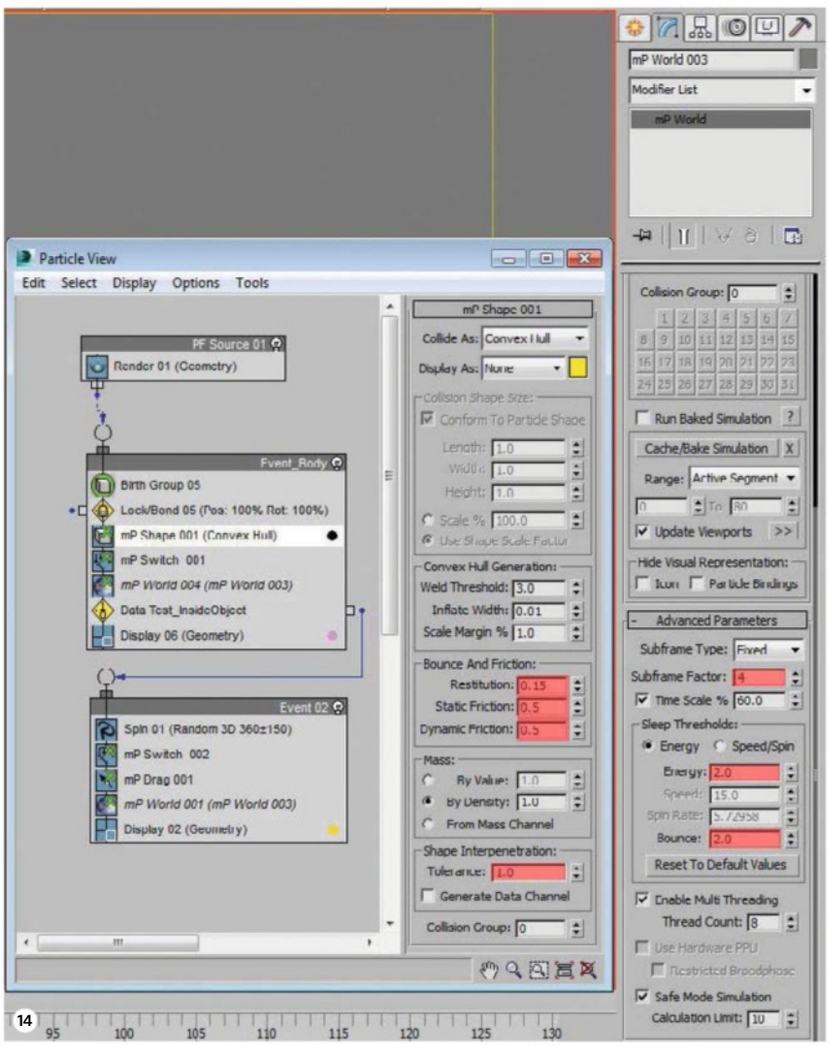
Apply new rules to the particle simulation



12 PhysX with a spin As the particles from the first event are loose, the Lock/Bond should not just fall down and collide with the ground, they should have some spin to them. Drag a Spin operator above the mpWorld in the second event and play with the Spin amount you like to achieve the desired effect. In order to make mParticles obey legacy operators we need an mpSwitch, so drag a second mpSwitch right under the Spin and set it to obey the legacy spin.

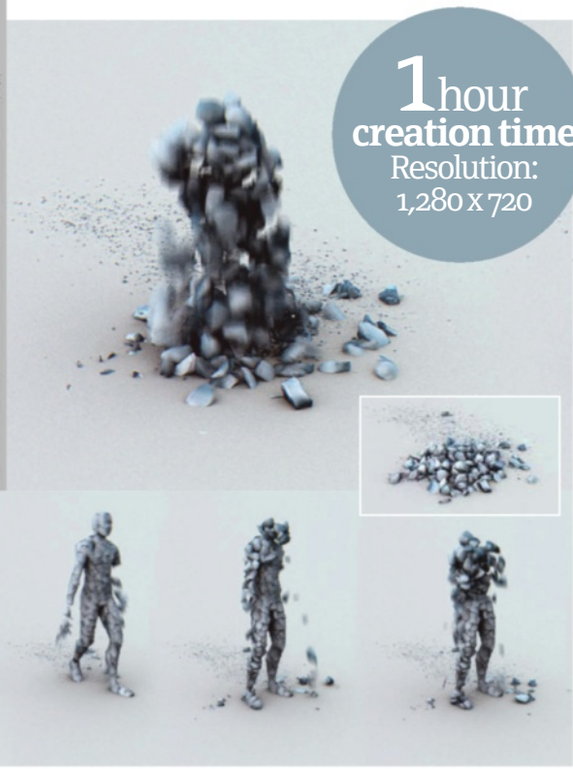
13 Tame the overall effect Some particles might spin a lot and some might bounce based on your Restitution and Friction settings in the mpShape and mpWorld helper. To tame this behaviour it's always good to have a little Drag introduced. mParticles has its own Drag operator for this, so drag an mpDrag under the mpSwitch. Check that you want to apply Drag to Angle and Rotation and play with the Amount value until it eventually suits the effect that you're looking for.





14 Reduce unwanted jumping or PhysXplosion There are a few factors that can cause undesired behaviour in your mParticles – usually Restitution/Friction and Subframe Factor/sampling. A lower sub-stepping might cause less chaotic bounce but less accuracy along the way. The Sleep Threshold is also worth playing with, as it takes particles out of the simulation until they are hit by another particle, so raising the thresholds for Energy and Bounce will tame particles once landed. There is no magic number here to fix everything, just find a good balance of all these different values.

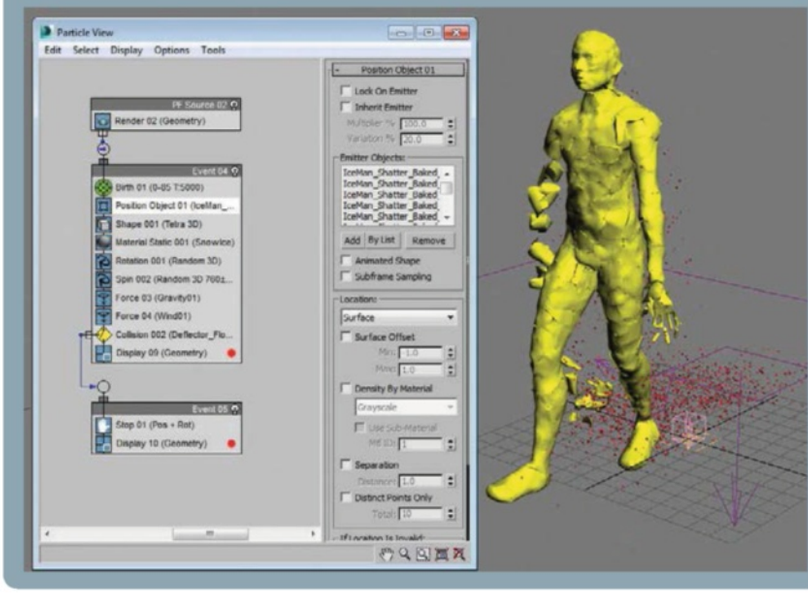
15 Cache or bake the final result If you plan to render on a render farm it is a good idea to cache the system either with Cache Disk, which is new to PFlow with ADM, or with the mParticles World. Set it to Viewport/Render and check Cache Test Result, then hit Update. If you bake it with the mpWorld helper click Cache/Bake Particles and let it run through the timeline, then check Use Baked Cache. This will ensure that every machine sees the same thing at render time.



15

Bonus round

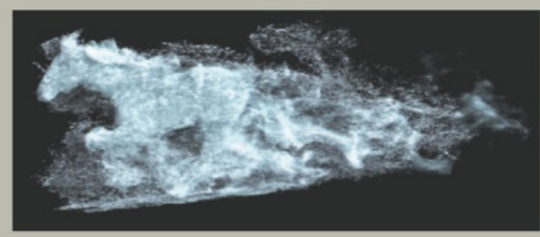
You could also use the PFlow Baker script (www.scriptspot.com/3ds-max/scripts/PFlow-baker) and bake the particles into meshes. Then you can pipe those into a new particle system where you spawn smaller debris from the falling pieces. Adding more detail by emitting from the baked particle surfaces like this can really enhance the overall effect. You will find a bonus max file with baked out particles and additional debris with the disc.



Artist Showcase

Anselm von Seherr-Thoss

I've created visual effects for movies, commercials and music videos for about nine years. My special fields are particle and smoke/fire/fluid simulations. I live and work out of New Orleans, where I run Incendii LLC Visual Effects. I have worked at studios like BLUR, Pixomondo, Atomic Fiction, Frantic Films and Psyop.



Snow horses **3ds Max 2010, PFlow Toolbox#2/3, V-Ray (2010)**
This is a collection of RnD I did for a Gazprom commercial. I want to show the still I really like – it's a snow horse. The image is, in its essence, this tutorial.

Constructor - A Particle System **3ds Max 2010, PFlow Toolbox#2/3, V-Ray (2010)**
You can watch this video in motion at: www.vimeo.com/14597952. The high-res model was pre-fractured with deconstructor by Marc Lorenz then passed on to Particle Flow's BirthGroup and triggered with a deflector.

Venus 2.0 **3ds Max 8, V-Ray (2006)**
This was an art piece I did while learning Particle Flow. I used the PFlow Toolbox#1 and a Max script that leaves particle trajectories as splines. The statue is the Venus de Milo that stands in the Louvre in Paris. It was rendered with V-Ray.

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3DArtist

Masterclass

Martin Mayer is a 3D animator and VFX artist. The technique he shows here blends traditional analog techniques with digital ones to fulfil the creative vision

Mayer has made it seem as though lush green grass is growing from a pavement edge

With the Disc

Tutorial files:
- Tutorial screenshots
- MODO (Contains the MODO scene)
- NUKE (Contains the NUKE script and source footage)

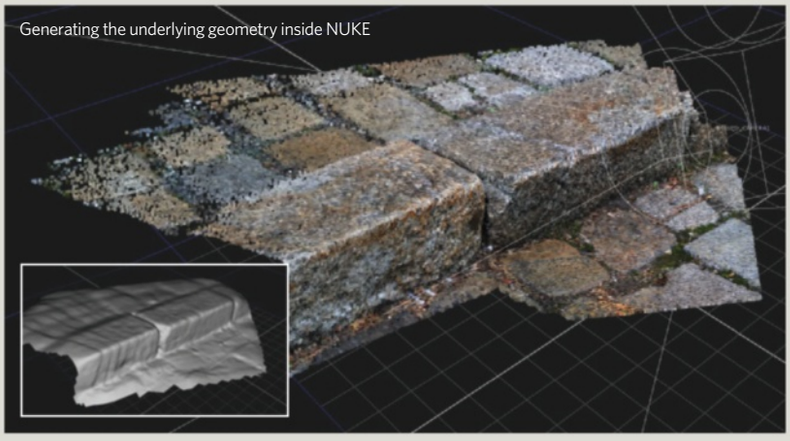
Use MODO and NUKE to blend CG and live action elements

"Martin Mayer combines real-world and organic CG elements using this proven industry pipeline"

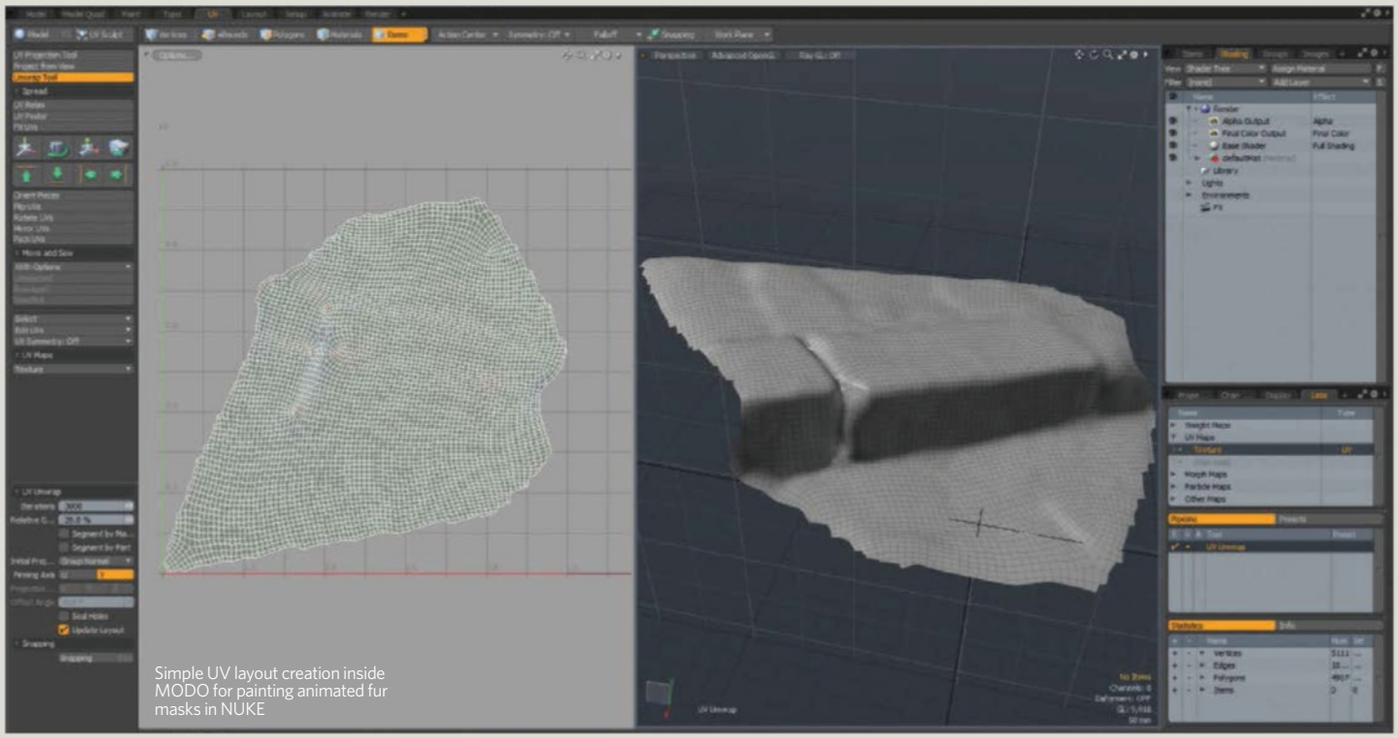
In this Masterclass we are going to create a scene that combines a real-life environment with CG elements, with the end result being as believable as possible. This is a technique that will be very useful for filmmakers looking to explore the integration of realistic effects into their scenes. In this example I went out to film live action footage of a pavement edge in my local area. Using MODO and NUKE we can make it appear as if lush grass is growing from the otherwise dreary area.

I love using CG in this way, and MODO really enables me to let my imagination run wild with these realistic organic forms. NUKE is a great application to use for this as it allows you to quickly and effectively create a 3D representation of the scene, which you can then make effective use of in a 3D application like MODO. The steps are actually fairly straightforward, and both applications make easy work of the processes involved. Ultimately, working on a project like this is good fun and it's great to see live action and CG come together on a finished plate.

With the disc you will find various scene files that will help you follow the tutorial, from tracking the supplied footage through to generating the foliage that we will cause to grow on it.



Generating the underlying geometry inside NUKE



Simple UV layout creation inside MODO for painting animated fur masks in NUKE

Realistic growth effects in MODO and NUKE

01 Capture and correct footage for tracking

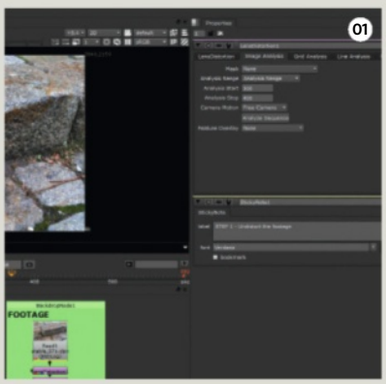
Before you can track the scene, you need to prepare the footage. In this case the footage exhibited a fair amount of lens distortion. Luckily NUKE has a perfect solution to fix this issue. By using the Lens Distortion node you are able to analyse the footage and get back a perfect undistorted version of the clip in a few easy steps. Bring in your clip to NUKE, add the Lens Distortion node, then switch to the image analysis tab and press Analyze the Sequence.

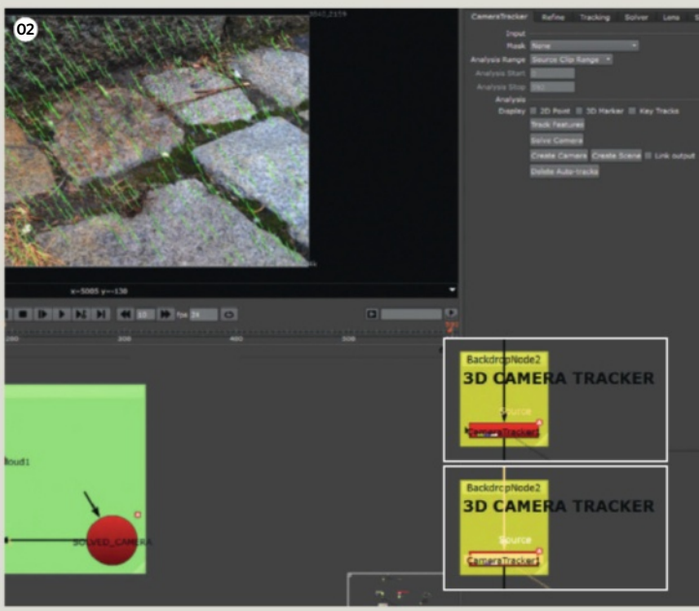
02 Track the footage and generate a point cloud

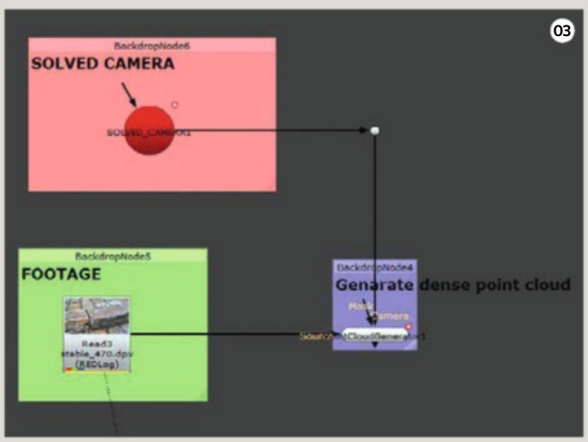
Once the distortion on your footage is corrected you can proceed to tracking and generating the 3D camera. To do so you need to bring in the Camera Tracker tool. Once the tracker is created you can go ahead and analyse the footage. With the Camera Tracker tool selected, press the Track Features button. If you know the focal length of your camera go to the Solver tab and input it in the focal length field. Once done press the Solve Camera button. With the camera solved, proceed to the Create Scene button.

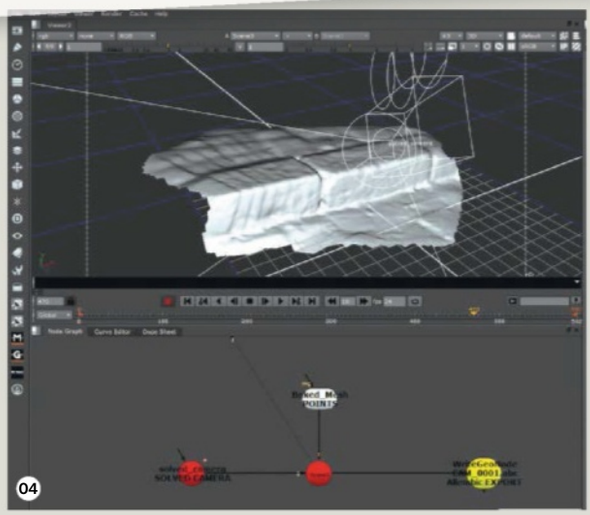
03 Create Reference model in NUKE

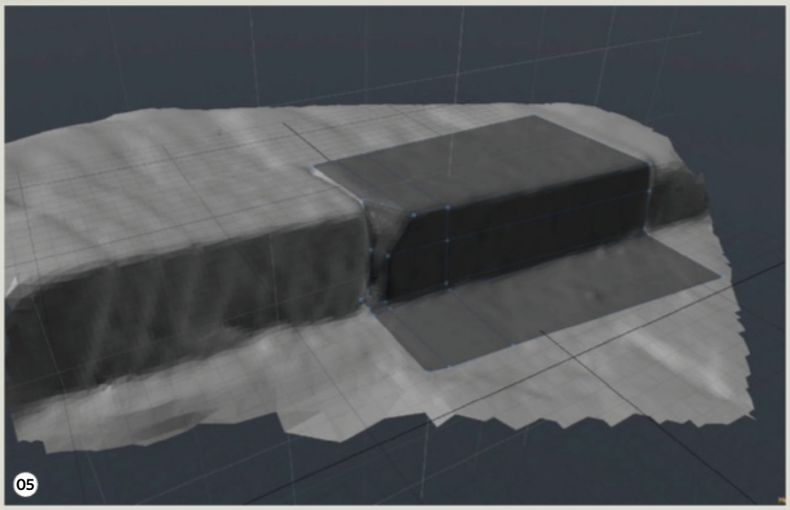
A quick and unique way to create reference geometry in NUKE is the Point Cloud Generator. Using this you can quickly create geometry to serve as a shadow catcher inside MODO or continue refining it to create a fully realised model. Here we will use the generated geometry in MODO to grow grass and capture shadows the grass would cast on the practical object. We will need a solved camera from the 3D Camera Tracker and matching source footage. Create the Point Cloud Generator tool and connect the camera and source footage to it. Analyse the sequence by pressing the Analyse Sequence button on the tool. With the camera solved, proceed to the Create Scene button. Once analysed, decrease the Point Separation to 1 and go ahead and press the Track Points button. With the points tracked let's create our geometry. To do so switch the Point Cloud Generator tool to the groups tab. Select all points and create a new group. Once done, press the Bake Selected Groups To Mesh button to create new geometry.





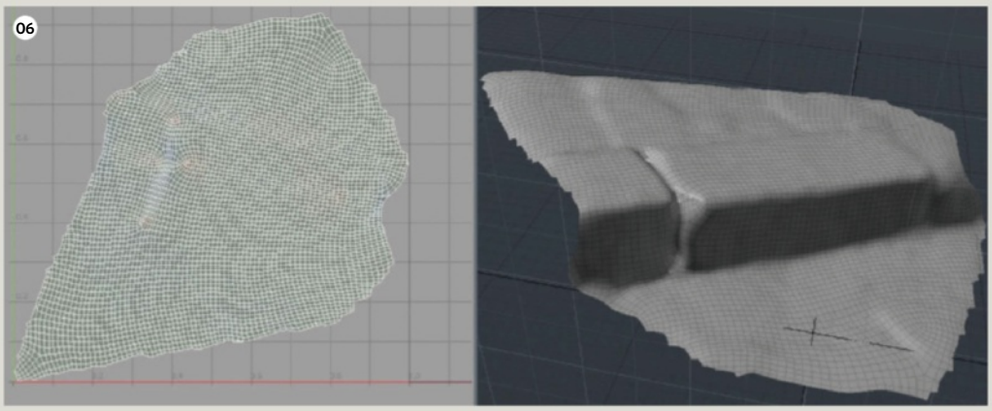






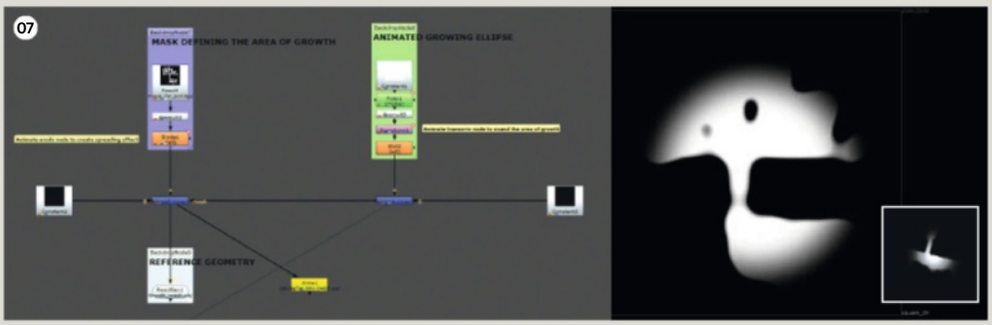
04 Export and transfer the camera and model data to MODO

Now that we have successfully created our geometry we can take it from NUKE to MODO for further massaging. The Alembic file format is the perfect transfer format to use here because of its ease of use and accuracy. This will transfer all connected geometries and camera data reliably. Create a new Scene node, connect the solved camera and our geometry to its inputs. Create a new Write Geo node and save the file as .abc. Press the Execute button to initiate the export.



05 Refine the model in MODO

Since the auto-generated geometry could use little bit of clean up, we can use MODO retopology tools to further enhance and simplify the model. Create a new mesh item to hold our clean geometry. Switch to the Topo tab and use the Topo pen to quickly retopologise our mesh.



06 Create UV map for use in NUKE

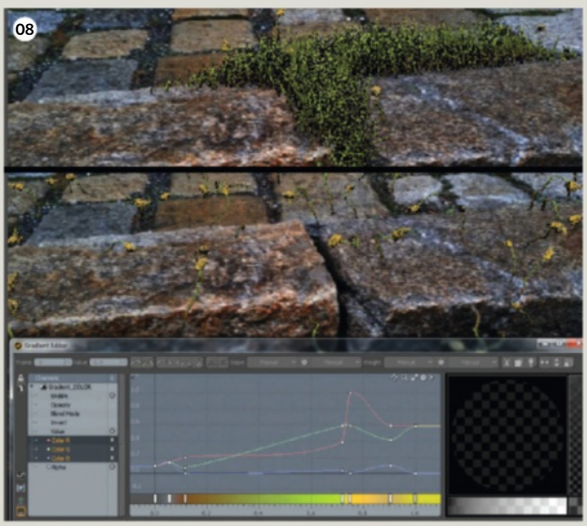
One of our main goals with this project is to create an animated system that will allow us to grow grass on top of our model. To accomplish this we will need a clean UV layout. MODO UV tools allow us to create one quite efficiently. Select your new mesh and then switch to the UV tab. Press the Unwrap Tool to create a perfect UV layout in one click.

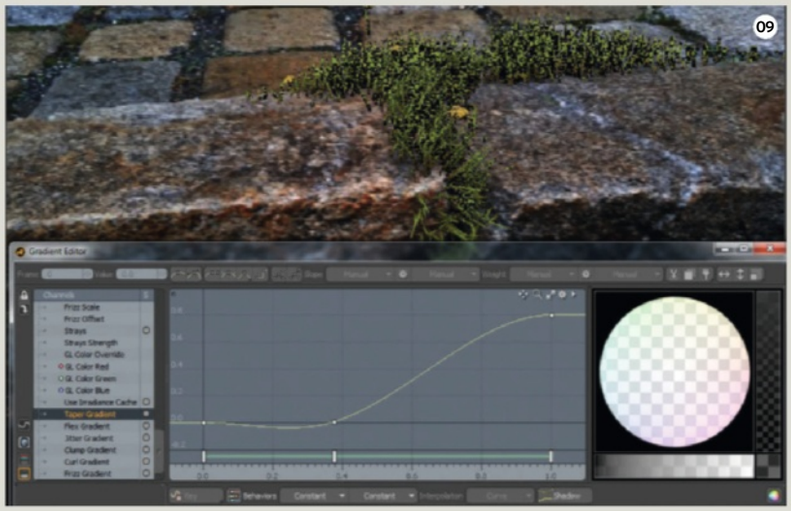
07 Create animated texture

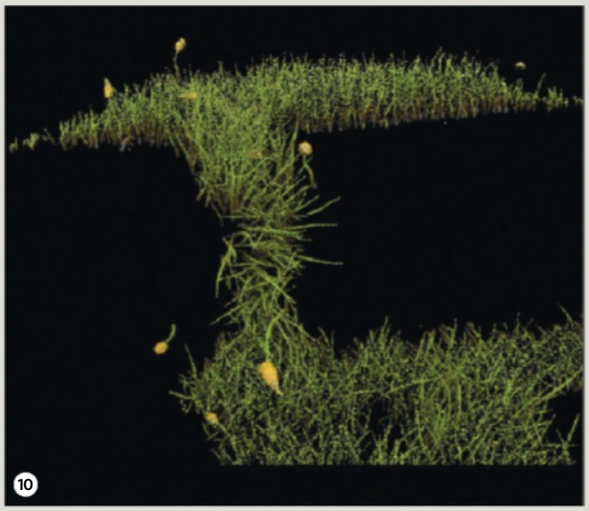
Now we are ready to create animated texture in NUKE to be used as a mask and to guide our growth and render it in UV map space. Let's create a simple ellipse and animate it, scaling up to create a spreading effect.

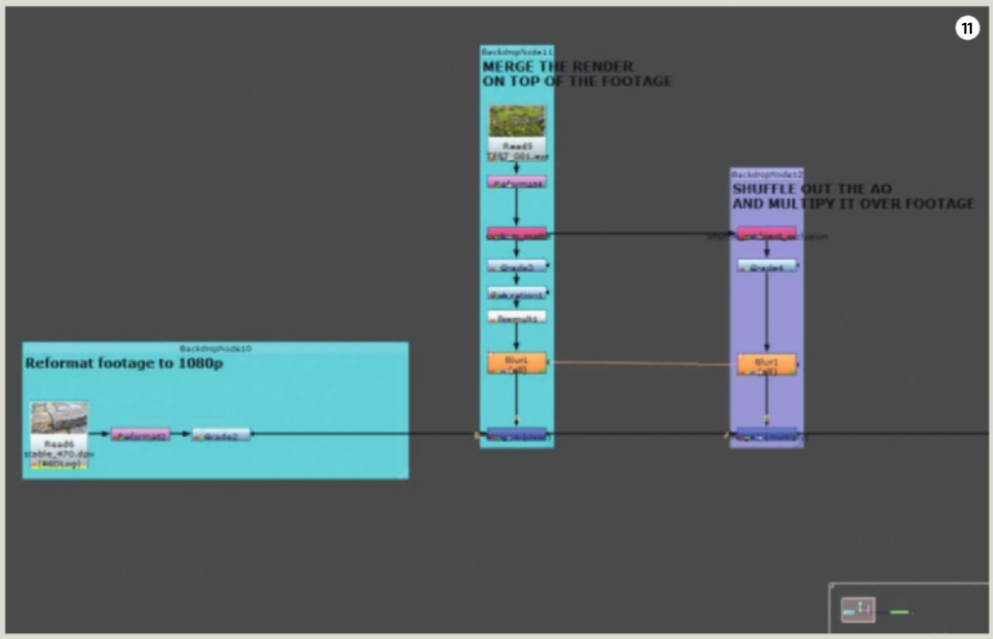
08 Create primary fur-based flowers

Let's go ahead and create our first fur system that will be used to generate large yellow spores. From the Add Layer dropdown in shader tree create a new group and check the Layered Fur checkbox. Now use the Add Layer button again to create a fur material and adjust the settings. We can use the tapering gradient to define the shape of the spores. To define the colour of our spores let's add another gradient and adjust the colour curve. To make the gradient wrap across the length of the spore we can change the Input Parameter to texture V and then change the projection type on texture locator to Implicit UV.









10 Set up render channels and passes in MODO

We're almost at the finish line. For successful compositing in NUKE I would like to create additional passes that will allow me to colour-correct individual areas of the grass for better integration and an AO pass to help create contact shadows. Creating various outputs in MODO is a simple process. Outputs can be created from the Add Layer dropdown in the shader tree. Once created you can change the type of data the output should capture. Let's make outputs that will give us Final Color Output, Ambient Occlusion Output, Alpha Output and a specific matte, capturing only the Fur alpha called matte.fur.

11 Composite in NUKE

Now in NUKE it is time to bring in our render and merge it with the footage. The render needed a bit of colour correction to better match with the footage colour values. This was accomplished by adding Grade nodes and saturation nodes to gain control over the colour values. Once happy with the basic grade, let's shuffle out the ambient occlusion and multiply it over the composite colour output to enhance the contact shadows. To make the sharpness of the render match better with the footage, the render was blurred out a bit too.

12 Final beauty lift and colour correction

Now we are ready for the finishing touches. Let's make it all pretty in NUKE. We can use Grade and colour-correct nodes to add atmosphere to the image. Optical effects such as distortion and vignette to enhance realism could be added as well. A great resource for these effects as prebuild gizmos is www.nukepedia.com where you can find excellent presets and tools to mix in a bit of that extra magic into your work.

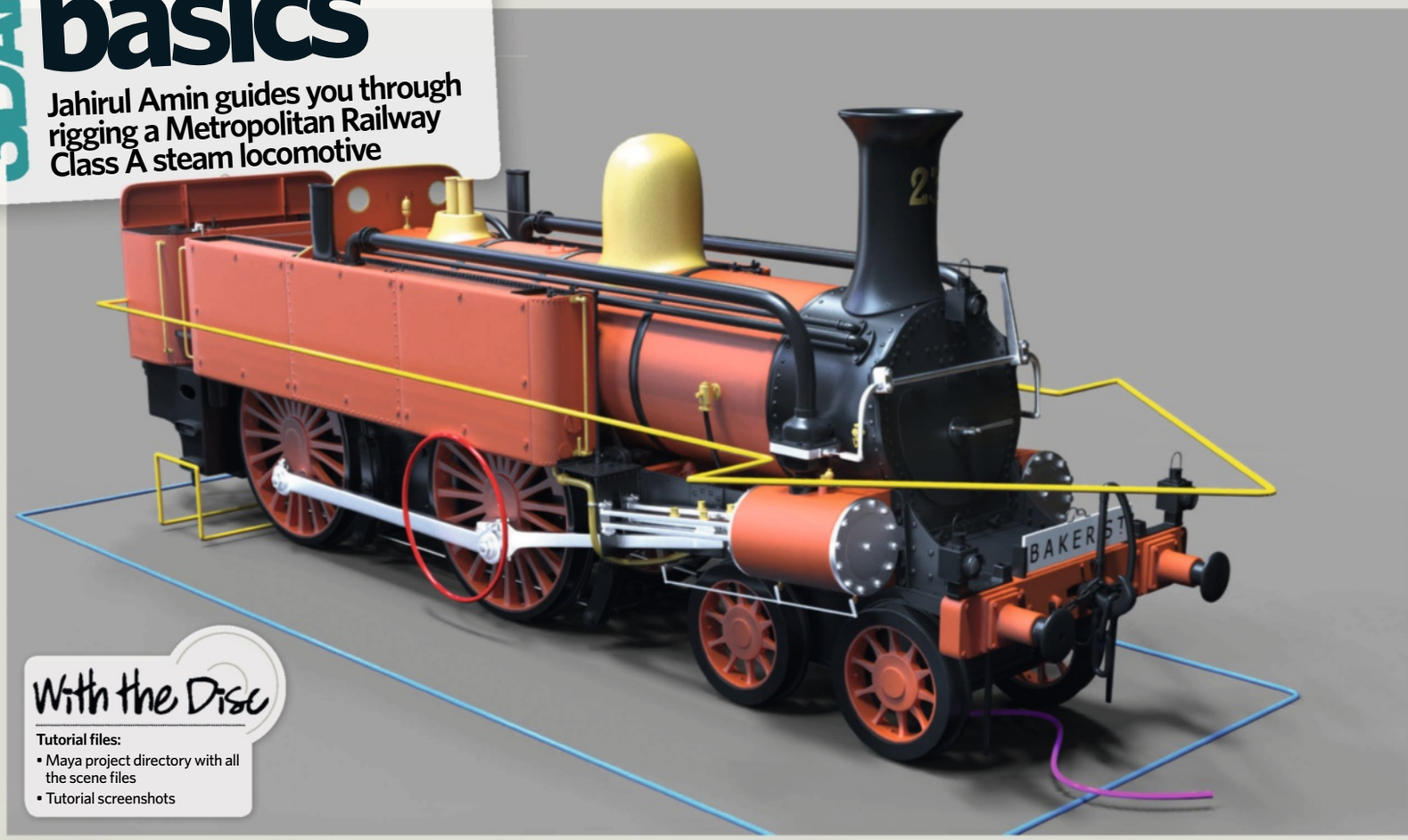
09 Prepare the secondary fur-based grass system

With the first system ready let's repeat the steps with a few adjustments to create a secondary grass system. From the Add Layer dropdown in the shader tree, create a new group and check the Layered Fur checkbox. Now let's use the Add Layer button again to create fur material and adjust the settings. We can use the tapering gradient to define the shape of the spores. To define the colour of our spores let's add another gradient and adjust the colour curve. To make the gradient wrap across the length of the spore we can change the Input Parameter to texture V and then change the projection type on texture locator to Implicit UV. Once we have both fur systems we can add our NUKE animated texture to MODO as an animated sequence and use it to drive our Fur systems to create the spreading effect.

• DID YOU KNOW? • All tutorial files can also be downloaded from: **www.3dartistonline.com/files**

Back to basics

Jahirul Amin guides you through rigging a Metropolitan Railway Class A steam locomotive



With the Disc

Tutorial files:
- Maya project directory with all the scene files
- Tutorial screenshots

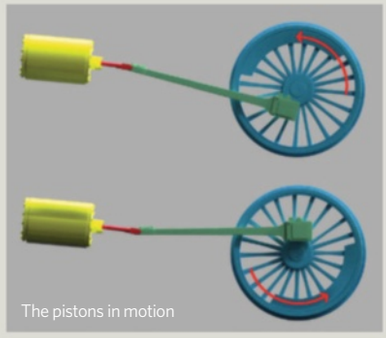
Rig a steam locomotive in Maya

"This tutorial will enable you to bring life to the pistons, crankshaft, wheels and brakes of a steam locomotive"

In this tutorial we are going to add the control rig to the locomotive that we modelled in Issue 60. The main focus here will be to get a believable motion happening with the pistons, the crankshaft and the wheels. There is no one way to approach this, so I encourage you to experiment. In my experience, I first intended to use a combination of constraints and Set Driven Keys to get the desired results. There's nothing wrong with this method, however, I then came across a technique of using Spline IK by the fantastic folks at Rigging Dojo (www.riggingdojo.com). They are an amazing bunch and I wholeheartedly respect their generous attitude towards passing on knowledge and educating the community. The method they describe is quick to set up and the results are very effective. Why re-invent the wheel? (Sorry, could not resist a pun.)

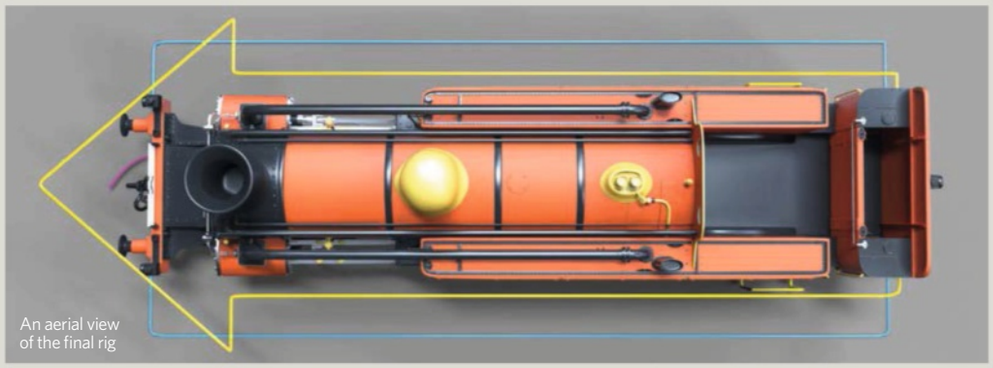
Once the main wheels are in place, we will be driving the smaller, leading truck wheels using an expression, so the speed of the revolutions sync up to the larger driving wheels. The brakes will come into play, and we'll again use a combination of joints, Spline IK and single-chain IK solvers. A main control will carry everything and we'll add a control so the train can follow a path.

Before we jump into the steps, I just want to inform you of a few changes I have made since we last left off. First, I have edited parts of the geometry, such as the length of the crankshaft and the position of the brake pads. This was to allow for the mechanics to work correctly without the parts intersecting each other. As you progress, you may find that you need to edit the position of some parts, so do so as necessary. I also found that some of the wheels were not perfectly centred so some alteration was needed. Second, I have gone through and named every piece of metal, every nut and bolt. I've tried my best to get the naming accurate but as I am no expert in locomotive parts, I have had to invent some names to help describe them. Finally, I have grouped the parts according to their sections and created layers for them so we can easily show and hide parts of the model.



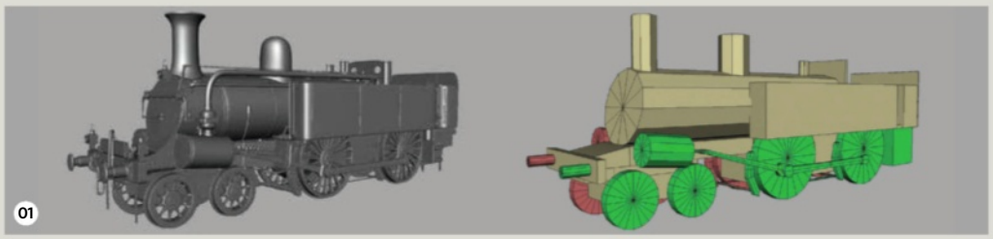
The pistons in motion

Clipboards and anoraks at the ready...


An aerial view of the final rig

01 Create a low-resolution train

Currently the train is pretty heavy and when playing back in real-time in the viewport we will be sure to get some performance slowdown. To allow the animator to view his animation results without having to resort to playblasts, let's create a low-resolution model that we can hook up to the rig. To do this, I simply use basic polygon primitives and translate, rotate and scale them to match the original model. Mainly I focus on the moving parts and anything that will add a sense of volume. Once the objects are in place, I label them accordingly, adding a 'LowRes' prefix to each object, and then colour code the left side from the right by applying Lambert shaders.

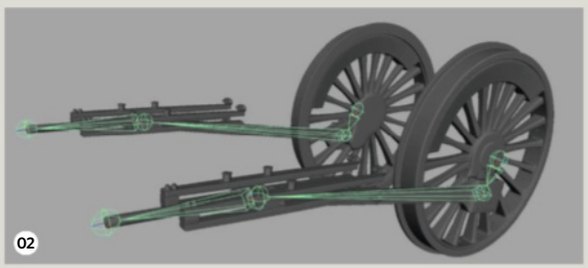

01

02 The piston and crankshaft joints

In the side view, create a four-joint chain starting at the centre of the 'l_front_driving_wheel_geo', dropping down to meet the crankshaft, up to the end of the piston rod and then ending at the root of the piston rod. In the perspective view, translate the root joint so it aligns with the geometry and then rename the joints from root to tip as follows: 'l_front_driving_wheel_jnt', 'l_crankshaft_jnt', 'l_piston_jnt' and 'l_pistonEnd_jnt'. Select the root joint and go Skeleton>Orient Joint (Options). Reset the settings by going to Edit>Reset and then change the Secondary Axis World Orientation to '–' using the dropdown menu. Forward movement will now happen from a positive Z rotation. Lastly, select the root joint once more. Hit Ctrl+D to duplicate the chain and translate it over to the other side. Rename the joints appropriately and then parent all the necessary low-resolution geometry parts to the relevant joints.

03 Add Spline IK and clusters

Go to Create>CV Curve Tool and set the Curve Degree to 1 Linear. Hold down the V key to enable Snap to Points or turn on the setting in the Status Bar and make three clicks starting at 'l_crankshaft_jnt', then at 'l_piston_jnt' and finally at 'l_pistonEnd_jnt'. Rename the newly created curve 'l_crankshaft_crv'. Next, go Skeleton>IK Spline Handle Tool (Options) and disable 'Auto create curve'. Next make three clicks in this order: 'l_crankshaft_jnt', 'l_pistonEnd_jnt' and lastly 'l_crankshaft_crv'. Rename the spline IK 'l_crankshaft_ik' and then hide everything but 'l_crankshaft_crv' and go into CV mode for it. Select the first CV at the root of the curve and go to Create Deformers>Cluster. Do the same for the second and third CV on the curve and then un-parent the curve from the joint it has been automatically placed under. Parent the first cluster under 'l_front_driving_wheel_jnt' and the Z rotation of that joint should now drive the piston. Take the second cluster and translate it towards the root joint but along the axis of 'l_piston_jnt'. This will help reduce any popping that can occur.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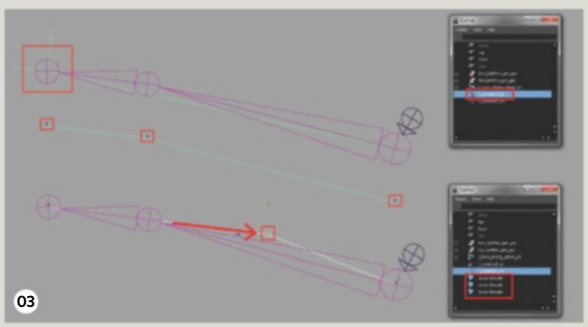
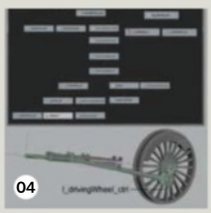

03

04 Wheel control and rig clean-up

To create the wheel control and some rig housework, go Create>NURBS Primitives>Circle and ensure Interactive Creation is disabled so it is created at the world centre. Rename the circle 'l_front_driving_wheel_ctrl'. Hit Ctrl_G twice to create two group nodes above the control. Rename the top-most group 'l_front_driving_wheel_ctrl_offset' and the next 'l_front_driving_wheel_ctrl_sdk'. To position the control, parent 'l_front_driving_wheel_ctrl_offset' under 'l_front_driving_wheel_jnt'. Zero out the values for translation and rotation on the '_offset' group. When the control is in place, un-parent 'l_front_driving_wheel_ctrl_offset'. To edit the shape of the control, do so in component mode. Parent 'l_front_driving_wheel_jnt' under 'l_front_driving_wheel_ctrl' to allow the control to drive the motion. Hit Ctrl+G to create a null. Rename it 'rig_doNotTouch'. Create another null and rename it 'l_drivingWheel_grp'. Parent 'l_crankshaft_ik' and 'l_cranshaft_crv' under 'rig_doNotTouch'. Parent 'l_front_driving_wheel_ctrl_offset' and the remaining two clusters under 'l_drivingWheel_grp'.

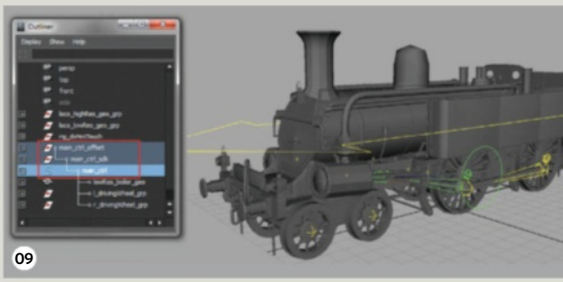

04

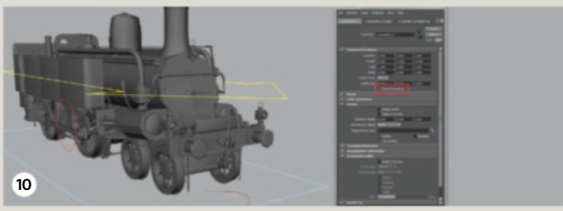
05

05 Rear wheel joints

We need the rear wheels to follow the rotation of the front leading wheels and for the connecting rod to come along for the ride. Using the Joint Tool, create a three-joint chain starting from the centre of the back wheel, moving down to the end of the connecting rod and then ending at the root of the connecting rod. Rename the joints from root to tip: 'l_rear_driving_wheel_jnt', 'l_connectingRod_jnt´and 'l_connectingRodEnd_jnt'. Align the joint chain with the connecting rod geometry in the perspective view and then use the Orient Joint tool with the settings we set previously to correct the orientation. Parent all the relevant low-resolution geometry to the joints.

3DArtist Back to basics



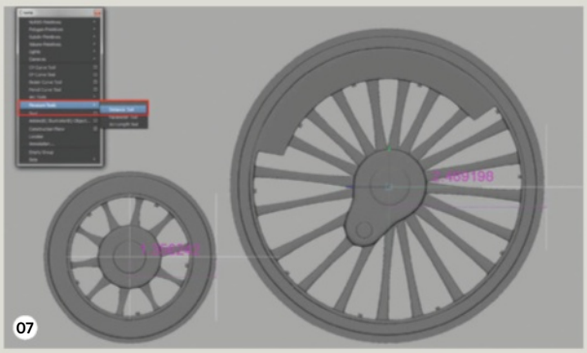


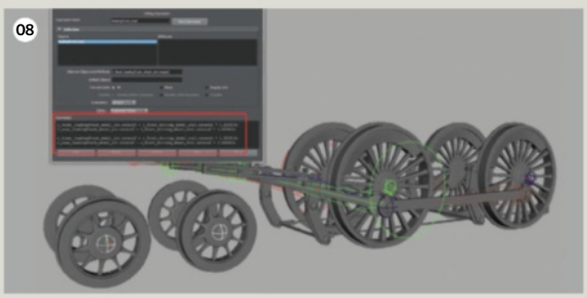
06 Rear wheel rig

Go Skeleton>IK Handle Tool (Options) and set the Current solver to ikSCsolver. Make an initial click at 'l_connectingRod_jnt' and then another click at 'l_connectingRod End_jnt'. Rename the newly created IK chain 'l_connectingRod_ik' and parent it under 'l_front_driving_wheel_jnt'. Open up the Connection Editor, which you will find under Window>General Editors. Select 'l_front_driving_wheel_ctrl' and click Reload Left on the Connection Editor window. Then select 'l_rear_driving_wheel_jnt' and click Reload Right. Open up the rotate attributes and connect rotateZ from the Outputs (left side) to rotateZ on the Inputs (right side). Parent 'l_rear_driving_wheel_jnt' under 'l_drivingWheel_grp' and all should follow along when you rotate the 'l_front_driving_wheel_ctrl' on the Z axis.

07 Leading truck wheels

We want the leading truck wheels to follow the larger driving wheels, but as they are smaller, the amount of revolutions will be greater in comparison to the driving wheels. So how do we get this right? First we need to find the circumferences of the larger and smaller wheels. To do this, I used the Distance Tool which you will find under Create>Measure Tool and measured from the centre of the wheels to the outside edge (make sure the wheels are smoothed) to find the radius of each wheel. For me, the smaller wheel had a radius of 1.356243 and the larger wheel had a radius of 2.469198. I then used the circumference equation of 2pir (2*pi*r) which gave the smaller wheel a circumference of 8.521526 and the larger wheel a circumference of 15.514428. I then divided the larger circumference by the smaller, which gave me a value of 1.820616 and that is the amount of times the smaller, leading truck wheels will have to rotate in comparison to the larger driving wheels.





08 Joints and expressions

Now to drive the leading truck wheels. For each wheel, create a single, independent joint and place it at the centre of the wheel geometry. I had Snap to Points enabled to get them into place. Rename the joints 'l_front_leadingTruck_wheel_jnt' and 'l_rear_leadingTruck_wheel_jnt'. To have the orientation of the joints match the larger wheel joints, with the joint selected, go into the Attribute Editor and set the Joint Orient to 0, 90, 0. Now open up the Expression Editor, which you will find under Windows>Animation Editors, and create the following expression:

l_front_leadingTruck_wheel_jnt.rotateZ = l_front_driving_wheel_ctrl.rotateZ * 1.820616;

l_rear_leadingTruck_wheel_jnt.rotateZ = l_front_driving_wheel_ctrl.rotateZ * 1.820616;

r_front_leadingTruck_wheel_jnt.rotateZ = r_front_driving_wheel_ctrl.rotateZ * 1.820616;

r_rear_leadingTruck_wheel_jnt.rotateZ = r_front_driving_wheel_ctrl.rotateZ * 1.820616;

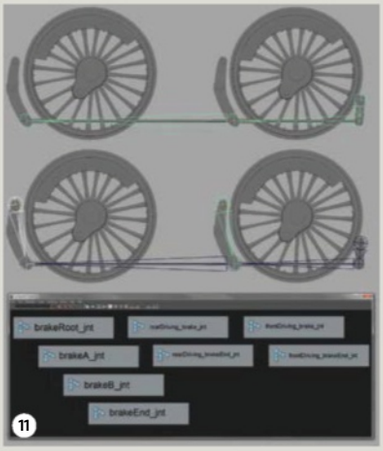
Using the 'l_front_driving_wheel_ctrl' should now drive all the wheels. Finally, parent the joints under 'l_drivingWheel_grp' and parent the low resolution wheels to the relevant joints.

09 Create the main control

Using the CV Curve Tool with the Curve degree set to 1 Linear, draw an arrow shape in the top-view. Rename the curve 'main_ctrl' and with it selected hit Ctrl+G twice. Rename the top-most group in the control hierarchy 'main_ctrl_offset' and the next 'main_ctrl_sdk'. To position the control, select 'boiler_geo', shift select 'main_ctrl_offset' and go Constrain>Point (Options). Disable Maintain Offset and hit Apply. Once the control snaps into place, select the 'main_ctrl_offset' and in the Outliner, delete the pointConstraint node living under it to break the connection. Next, parent 'l_drivingWheel_grp' under 'main_ctrl' and we now have a control to drive everything.

10 Path follow and Global SRT controls

With the CV Curve Tool again, create two more controls in the top-view: a large rectangular shape that surrounds the train and a squiggle curve placed towards the front of the train. For the squiggle, I set the Curve degree to 3 Cubic. Rename the rectangular shape 'global_SRT_ctrl' and the squiggle shape 'pathFollow_ctrl'. Leave both control origins at the centre and, like we have for every other control, create the control hierarchy by grouping each control twice and naming accordingly. Then parent 'main_ctrl_offset' under 'pathFollow_ctrl'. Lastly, parent both 'pathFollow_ctrl_offset' and 'rig_doNotTouch' under 'global_SRT_ctrl'. If we want to animate the train along a path, we can use the 'pathFollow_ctrl' to do so yet still retain the ability to animate on top using the 'main_ctrl'. If you move and rotate the 'global_SRT_ctrl' and then the 'main_ctrl', you'll notice that the wheels bug out. To fix this, select the 'l_crankshaft_crv' and open up the Attribute Editor. Under the Transform Attributes, disable Inherits Transform and all should be well.



11 The brake joints

For the brakes, we will create three separate joint chains. The first set will be the driver and will originate at the back of the train; the second and third sets will allow the brake pads to pivot in order to make contact with the wheels. In the side view, create a four-joint chain: start at the root for the brake origin, come to the tip of the brake origin, then to the first brake pad and end at the final brake pad. Rename the joints from root to tip: 'brakeRoot_jnt', 'brakeA_jnt', 'brakeB_jnt' and 'brakeEnd_jnt'. With the root joint selected, use the Orient Joint tool to match the other joints we've created so far. Now, create a two-joint chain for each brake pad, starting at the point from where the brake pad will pivot, and ending at the location from where it will be pulled. Rename the joints 'front_driving_brake_jnt' and 'front_driving_brakeEnd_jnt' for the front set and 'rear_driving_brake_jnt' and 'rear_driving_brakeEnd_jnt' for the rear set. Leave all of the joint chains on the centre line on the grid.

12 Brake IK setup

First, go Create>CV Curve Tool and set the Curve degree to 1 Linear. Then enable Snap to Points and make three clicks in the following order: 'brakeA_jnt', 'brakeB_jnt' and finally 'brakeEnd_jnt'. Rename the curve 'brake_crv'. Next go Skeleton>IK Spline Handle Tool and make sure Auto Create Curve is disabled. Then, in this order, select 'brakeA_jnt', 'brakeEnd_jnt' and then 'brake_crv'. Rename the IK handle 'brake_ik'. Select 'brake_crv' and go into component mode and one by one add a cluster to each CV starting from the root and working down the curve. Take the first cluster (at the root of the curve) and parent it under 'brakeRoot_jnt'. Now we will create two further IK handles. Go Skeleton>IK Handle Tool and make sure the Current solver is set to ikSCsolver. Create the first IK handle from 'front_driving_brake_jnt' to 'front_driving_brakeEnd_jnt'. Then the second IK handle from 'rear_driving_brake_jnt' to 'rear_driving_brakeEnd_jnt'. Rename the handles 'front_driving_brake_ik' and 'rear_driving_brake_ik'.

13 Brake control and rig clean-up

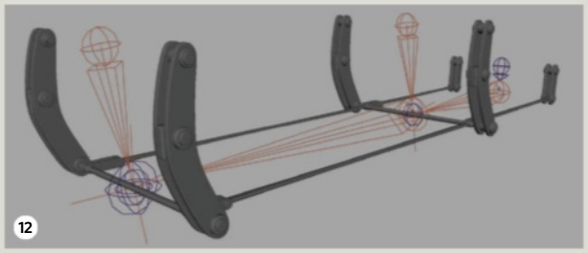
For the brake control, I again used the CV Curve Tool to draw out a shape. Rename the curve 'brake_ctrl' and group it to itself twice to create the control hierarchy. As for previous controls, add a suffix of '_offset' and '_sdk' to the newly created group nodes. I then parented the '_offset' node under 'brakeRoot_jnt', zeroed out the translation and rotation values so the control snapped into place and then un-parented the control. I then quickly modified the control in component mode to get it looking as it does. With the control in place, parent 'brakeRoot_jnt' under 'brake_ctrl'. Now for some spring cleaning. Create an empty group by hitting Ctrl+G and name it 'brake_grp'. Parent 'front_driving_brake_jnt', 'rear_driving_brake_jnt' and the two remaining clusters under 'brake_grp'. Then select 'brake_grp' and 'brake_ctrl_offset' and parent them both under 'main_ctrl'. Remember to also disable Inherits Transform from the 'brake_crv'.

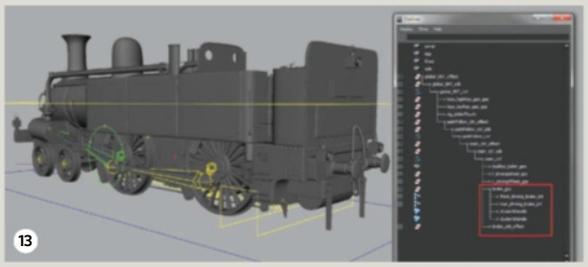
14 Lock and Hide channels

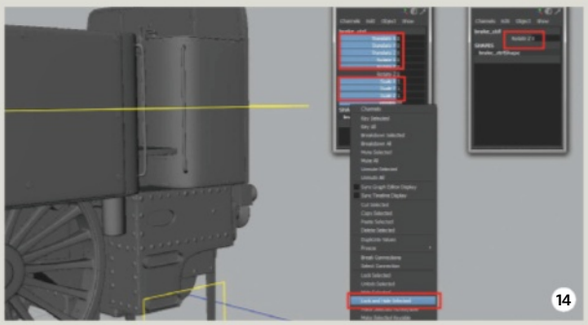
Now that all the controls are in place, let's quickly go through and hide some of the attributes so they cannot be keyed. First select 'l_front_driving_wheel_ctrl', 'r_front_driving_wheel_ctrl' and 'brake_ctrl' and in the channel box, highlight all the translate channels, rotate X and rotate Y and all the scale channels. Hold the right-mouse-button down and go to Lock and Hide Selected. Then select 'pathFollow_ctrl' and 'main_ctrl' and lock and hide all the scale channels.

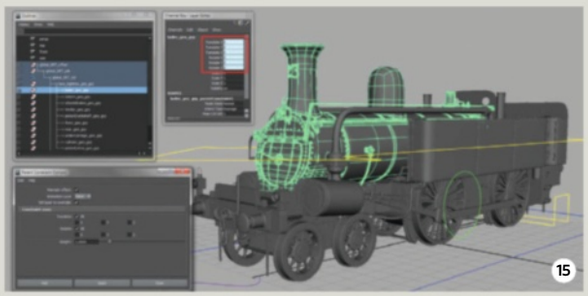
15 Constrain the geometry to the rig

The final thing we need to do is parent constrain the high-resolution geometry to the rig. I've decided to use parent constraints as opposed to general parenting as this will allow me to keep the main geometry separate in the hierarchy. This will make it easier for me to find geometry elements as I will not need to go digging through a rig. As mentioned in the intro, I grouped different parts of the train together to make it more manageable. This worked in my favour as I could now simply parent constrain those groups to the relevant controls or joints. You may need to create sub groups within the groups, as you may only need certain objects from a group to follow a specific joint/control, so do so as required. Next issue, we will discuss animation!



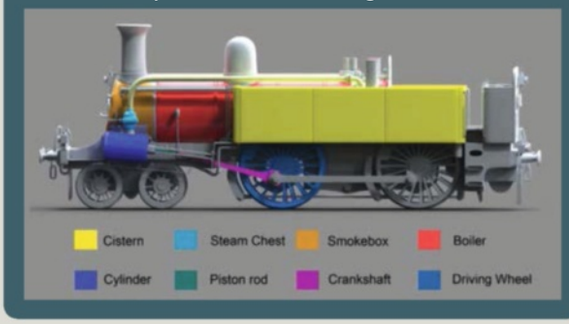






Steam, wheels and locomotion

So how exactly does a steam locomotive get about? First the coal burns on the grater situated at the back of the boiler. Gases and smoke created in the boiler are sent to the smokebox. The heat is captured by water in the cisterns. The steam produced here heads into the cylinder through a steam chest. This chest regulates the steam going into the cylinder allowing the piston to be pushed back and forth. The back and forth motion of the piston rod is connected to a crankshaft that drives the rotary movement of the driving wheels.



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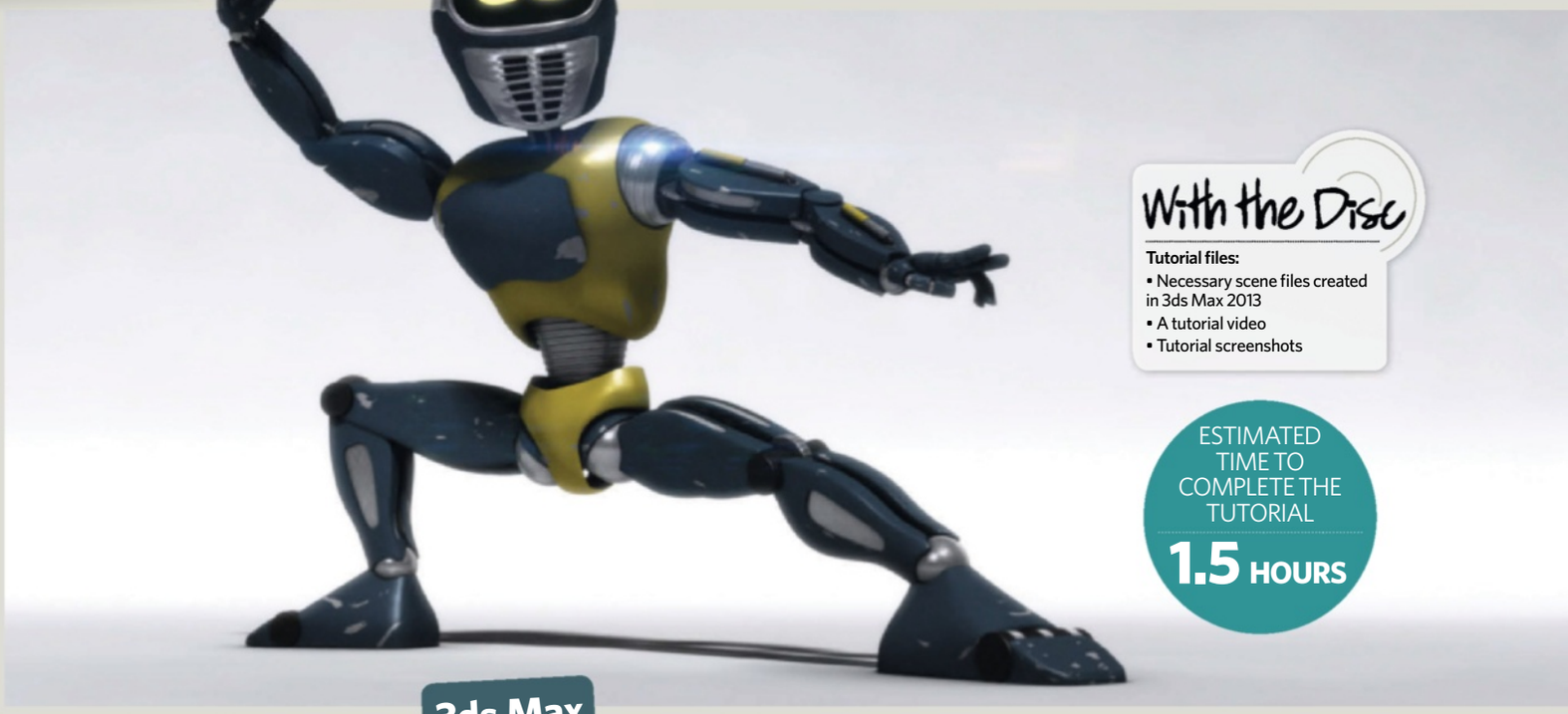
Dave has worked for some of the biggest clients in the entertainment industry over 13 years, including Disney, Warner Bros., Plastic Wax and Liquid Animation

MODO 701
Juhani Karlsson
vimeo.com/user1979273

Juhani works as a technical director at Finnish animation company Talvi Digital. He makes commercials and movie VFX and has been an avid MODO user since v102



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Tutorial files:
- Necessary scene files created in 3ds Max 2013
- A tutorial video
- Tutorial screenshots

ESTIMATED TIME TO COMPLETE THE TUTORIAL
1.5 HOURS

3ds Max

Character rigging without bones

"What would you say is the easiest way to rig a simple character in 3ds Max?"

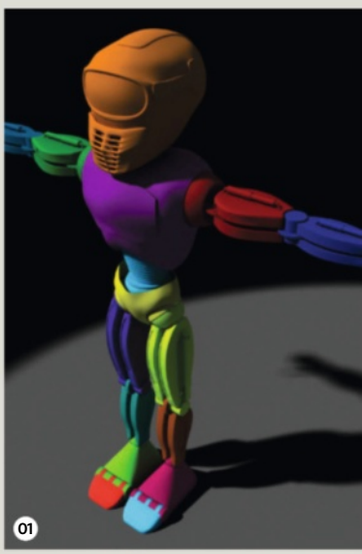
In the world of 3D, one of the most technically demanding and sometimes frustrating processes is character rigging, but it doesn't always have to be this way. Although it can depend on the character model and the specific needs of the animator, sometimes we technical types tend to over-complicate the process.

So what is character rigging? Put simply, it's the process of binding or constraining a character model to a set of joints and control objects, for the purpose of posing and animating the character. In a production pipeline, this task is normally performed by a character technical director or TD. The character TD has a very demanding job for a number of reasons. They have to provide controls that suit the needs of the animator, while always maintaining the creative vision of the director. They have to be true to the physiology and physics that govern the character and they usually have to work fast.

What I have found in my career, and I have been guilty of this, is the longer you work in this area, the more complex your solutions become. I have various theories about why this happens that I won't cover in this tutorial, just know that it happens. My hope is that by following this tutorial, you will be exposed to an extremely simple solution to rigging a character for movement. Then, when tasked with rigging your next character, you might consider starting with the simple techniques, before moving onto the more complex solutions.

For those of you who have never rigged a character, this tutorial will offer a valuable insight into the process and provide a great starting point for building your rigging knowledge. As for the more experienced operators, this will certainly serve as a reminder that character rigs don't always have to be as complex as we make them.

However, it is important to note the character I have chosen for this tutorial has no organic mesh that stretches across joints. This a deliberate decision for the purpose of illustrating the basic joint hierarchy of a character, without getting bogged down with skinning. In fact, once the rig is complete, the character could easily be used as a skeleton rig inside an organic character. The point being, the method shown here is the same that can be used to rig a skeletal system for a more organic skin-based character.



01

growing community at www.3dartistonline.com

ZBrush
Thomas Lishman
www.tlishman.co.uk

Thomas is an experienced digital artist specialising in sculpting. He currently works as a freelance sculptor for such clients as NECA Toys and McFarlane Toys

3ds Max, UDK
Rainer Duda
www.rainer-d.de

Rainer Duda has over ten years of game development experience. He is currently a freelance 3D generalist with focus on asset creation for videogames

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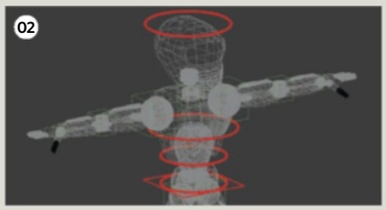


Build an animation-friendly robot

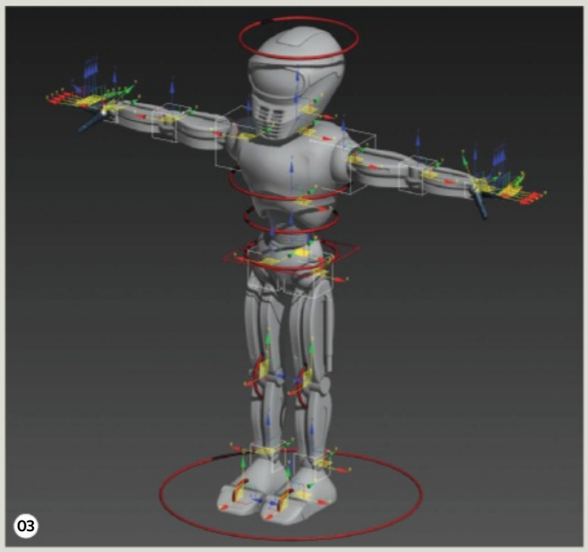
If you ever decide to model a simple robot, and I certainly recommend it to anyone starting out, don't forget about joint articulation. Every joint falls into essentially two types – the ball joint or the hinge joint. For example the shoulder is a ball joint and can rotate on all three axes, however your finger joint can only rotate on one axis. Knowing this and applying this knowledge to the model, as you build it, will make a huge difference when the time comes to rig the character.

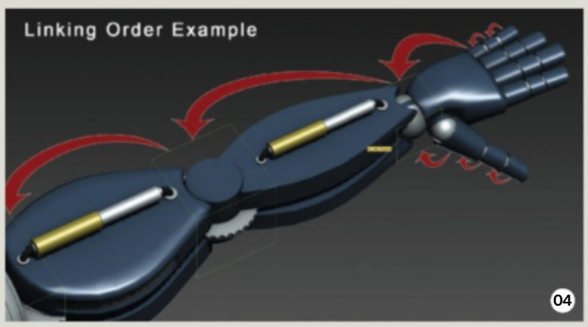
01 Prepare the mesh for rigging

The first task is to prepare the character for rigging. This is the best time to unify character sub-objects. For example, if your character has a number of meshes that make up the forearm, you should group these objects or convert them into one mesh. It's also a great time to ensure you have named all objects using meaningful names. You shouldn't use standard object names like Box01 or Sphere13. The more time you spend in the preparation stage, the easier the rigging process is, especially if you need to diagnose any issues.

02 Create dummy and control objects

It's better to avoid rigging the character mesh. Instead we'll create a series of dummy objects and controls, which the character mesh is then linked to. This keeps the mesh separate from the rigging and enables mesh changes without destroying the rig. However, we will be using a combination of Dummy, Spline and Mesh objects to control animation. In a Top viewport, create a Dummy or Spline object for each character joint and roughly position them.





03 Perfect the pivot points

The most important step in any rigging process is establishing the correct pivot point location for every joint. If the pivot points are in the wrong place, the character will not move correctly. For the dummy objects, all we have to do is place each dummy at the 3D axis point of its corresponding character joint. However, for the controllers and fingers, you can change the pivot points by using the Pivot Point Only button in the Hierarchy tab. Use the Top, Left and Front viewports to line it up. The Perspective or Orthographic viewports are the least accurate views to judge 3D distance or position.

04 Establish the link hierarchy

Now that everything is positioned, we can start linking the elements together. Using the Link tool, attach the geometry to the relevant Dummy or Control objects. It's very important to get the order right. The Toe controller should link to the Ankle Dummy, the Ankle Dummy should link to the Knee Dummy, the Knee Dummy should link to the Hip Dummy and so on, until the whole character is linked together. This makes a child/parent relationship between all of the body parts with the Character Master object being the grandparent in the hierarchy. Always remember to link the child to the parent.

05 Carry out extra tests

It's important at this stage to put the rig through a series of extreme poses. Now is the time to find problems, not when you, or someone else, is in the middle of the animation. The goal here is to try to break the rig. This is the only way to know where the breaking points are. Look for unwanted movement or rotation and try to track the issue back to its source. As we are only using a link-rig system, there shouldn't be any real issues. The only problems will be incorrect pivot locations or a linking issue.

06 Lock everything down

Now that you have confirmed the rig will stand up to the job, we need to lock it down. This means freezing all of the mesh elements. We should also lock the unused axis for the control and Dummy objects. For example, an elbow joint only needs to rotate on one axis, so it's a good idea to lock the other two axes. This can be done using the Hierarchy tab in the Link Info panel. You can also lock the position and scale the axis for various joints. This doesn't mean the joints can't move, just that the animator can't move them independently.

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15 MINS

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Tutorial files:
- The MODO scene
- Various textures
- Video flythroughs
- Tutorial screenshots

MODO 701

Using MODO Replicators

"How can I re-create the complexity and detail of nature in MODO?"

In the Seventies, Mandelbrot introduced us to fractals. Ever since it's been clear that much of nature manifests itself in repetitive patterns. In MODO you can approach this complexity using Replicators.

Stones, grass, leaves and even complete forests can be created using Replicators. While these aren't fractals, they supply artists with the power to create something that's naturally repeating. Animation in Replicators also offers the possibility to create non-static variation in a scene. This means that generating grass swaying in the wind just became easy!

Replicators are render-time instances of geometry and they can be controlled using various methods. The simplest way is to create point sources such as a grid mesh that contains vertices. You can then use Replicators to instance objects to each vertex of the model.

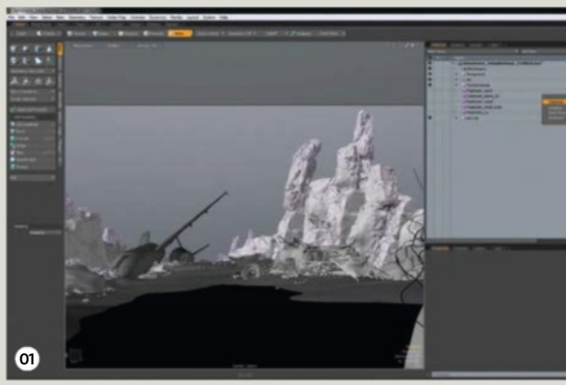
Because Replicators take pretty much everything that contains vertices as their Pointsource input, they can be used very creatively. Groups of objects can also be replicated if there is a set of prototypes that is needed for replicaton.

MODO also has very unique feature called Texture Bombing or Texture Replicators. This means that you can use Replicators for texture projections and create naturally tiling textures in very complex scenes.

Another advantage is that Replicators occur during render time only. This means that you can render dense scenes and don't have to worry about a sluggish viewport. They appear as bounding boxes and can be easily toggled on and off.

In this tutorial we'll consider a workflow used for creating Replicators in a complex scene. We'll start by creating a Replicator item, its Prototype and Pointsource. This gives us a good starting point for achieving the look we're after. The Replicator item contains all the Replicators. Prototype, on the other hand, is the object to be instanced and the Pointsource is where they will be instanced.

Next we can tweak the Replicators' orientation, the Size parameter and mask the Replicators so that they appear only in the desired areas. Finally we'll check how the render looks in the preview window and render the final image.

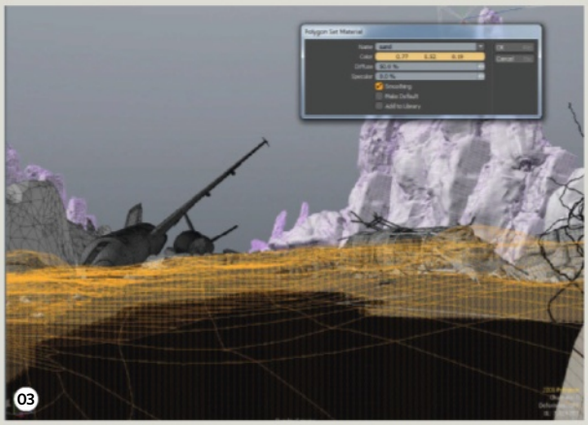


01 Get started with a Replicator item

There are many ways to create a Replicator item, but one of the simplest is to create it from the Item List: Add Item>Particles> Replicator. This item will contain and instance your Replicator items and will require two inputs. These will be the Pointsource and Prototype. The Prototype is the item to be replicated by the Replicator item. The Pointsource will be the mesh or surface generator that will be taking care of the transforms. Think of this as a set of points where the Prototypes will be placed.

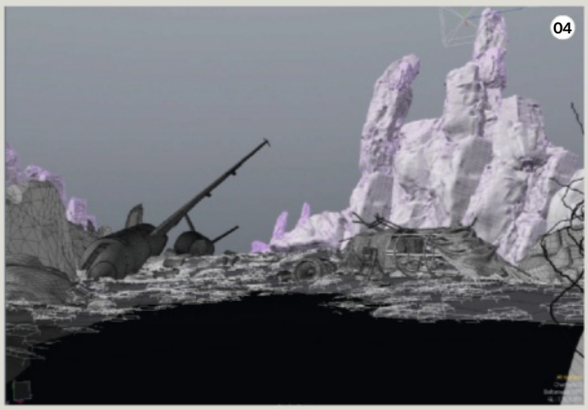
02 Create the Prototype

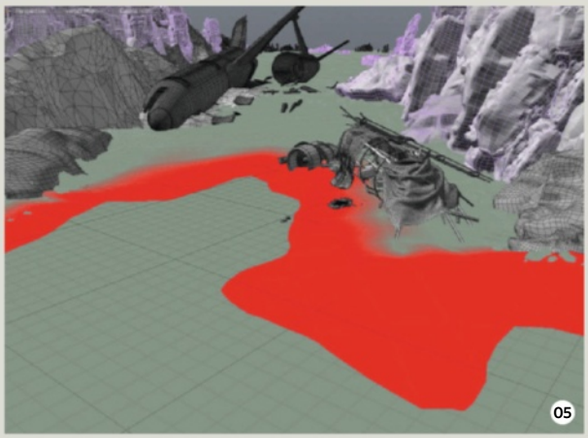
In this scene we'll need to replicate stones and vegetation on the ground. The Prototype object is a set of stones previously created and the Prototype mesh needs to be centred just above the desired origin. You can use the MODO content library to get the meshes that are needed or you can create them from scratch. Rocks are found under Meshes>Organic>Rocks. Add this item to the Replicator Items Prototype input. MODO's content library has a nice collection of natural models so make sure you use it to your advantage!

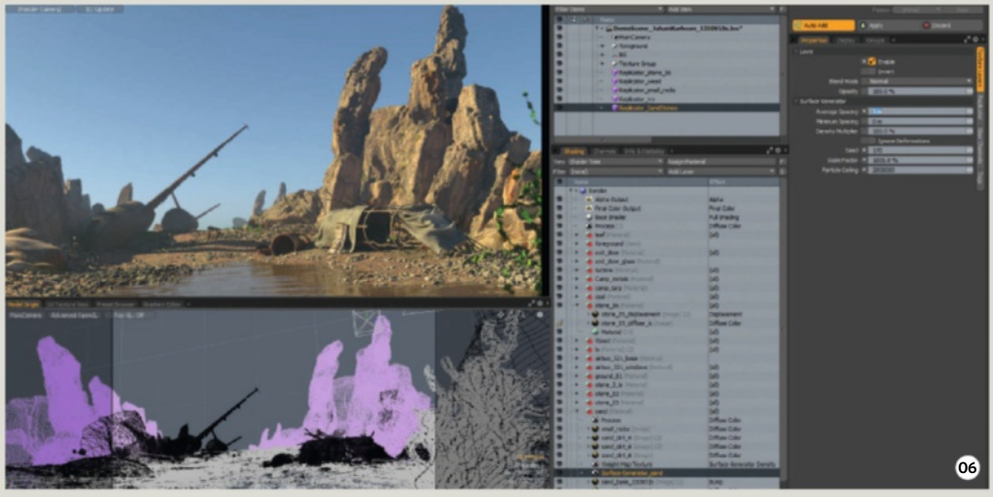


03 Add in the Surface Generator

A Surface Generator will randomly sample points on the surface and create Pointclouds for the Replicator item. First we need a material where we can apply the Surface Generator. Here we want to replicate the stones onto the sand surface, so select the surface and add a new material using the M keyboard shortcut. Go to the Shader Tree and go to Add Layer>Special>Surface Generator. Drag the Surface Generator under your new material. You can then tweak the values of the Replicators. Average Spacing, Seed and Particle Ceiling are the key values. Remember to add the Surface Generator as the Pointsource to the Replicator item.







Some other uses for Replicators

Replicators can be also used together with MODO Particle tools, making for more freedom to create interesting effects. You can also use them as sprites by using the Look Art particle modifier or simply freeze the simulation and use it to place Replicators in more creative ways. Replicators can also be used for organic texturing with Texture Bombing. Here every Replicator represents texture projection that can be altered with same rules as normal replicators. You can find this under your Image Layer>Texture Locator>Texture Replicator.

04 Achieve the correct look and randomness

Once you have Replicators' bounding boxes visible, it's time to tweak the settings to achieve a believable look in the randomness. First scale the particles to the desired size with the Surface Generator's Scale Factor parameter, then go to the Replicator tab and input 180 degrees to the Random Twist Y parameter. This makes the stones less repetitive than when they are aligned to the surface. Also add 25% of Random Scaling for a more natural look.

05 Mask Replicators

We want to keep these rocks only in the shore of the scene, so masking the Replicators becomes important. Select your Pointsource object and create a new Weight Map under the Lists window. Next, select the area you want to mask and hit Shift+W to activate the Weight tool and add value to the Weight Map. You can view the Weight Map in Vertex Map Shading mode. Go to the shader tree and add Processing>Weight Map Texture Layer. From the Texture Layers tab select your Weight Map and set the effect to Surface Particle Generation>Surface Generator Density. This is an extremely powerful way to control the Replicators' densities.

06 Make final touches and render

Go to the Render view and check how the scene looks. Usually it's not until rendering that you really see how the Replicators look because OpenGL views them only as bounding boxes. You can also create more Weight Maps and textures to control the Size and Normal of the Replicators. These too can be found under the Layer Effects>Surface Particle Generation. Once the Replicators look balanced, press F9 and enjoy your render!

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Tutorial files:
- Final skin material as created in tutorial
- Final PSD comp
- Tutorial screenshots

ESTIMATED TIME TO COMPLETE THE TUTORIAL
1.5 HOURS

ZBrush, Photoshop

Rendering skin in ZBrush

"How can I use ZBrush to render my sculpts?"

Rendering in ZBrush has improved vastly since its initial release, with users now able to create results that can even match the results of any high-end software that's been designed specifically with rendering in mind.

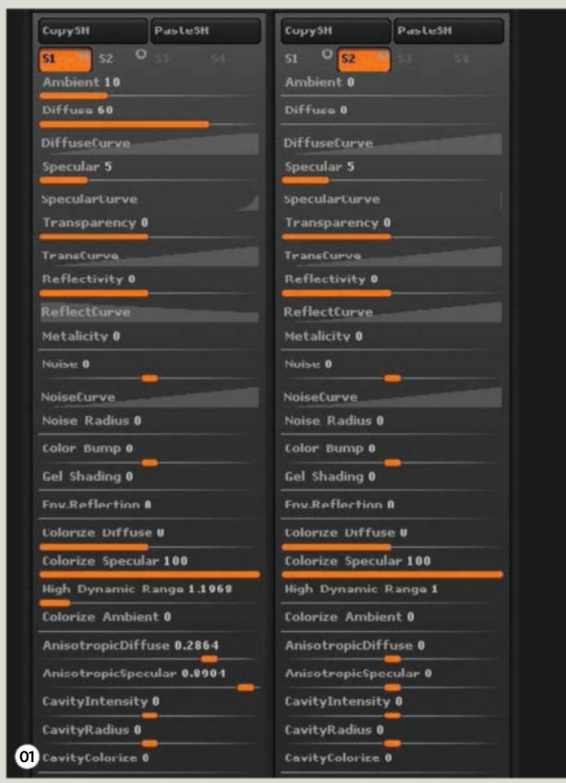
In this tutorial, I'm going to show you how to set up materials, lights and render settings that can provide brilliant results with minimal time, using only ZBrush and Photoshop.

When creating a progress render for a client, I like to keep a steady workflow. As such I use a preset file that I can import my sculpts into to instantly render export passes then composite within Photoshop. This keeps my entire workflow within my main two programs: ZBrush and Photoshop. Although it may take a few hours to set up initially, once completed it provides a quick way to present your work, and then make alterations afterwards.

Unlike some methods, I prefer to render each light out separately then comp those together so I have more control over the mood and feel of the scene. As rendering in ZBrush is relatively much faster than external renderers, you can afford to do this. With practice you can create a vast range of lighting setups, and even save those out separately and load those them in whenever they are required for use.

01 Set up your skin shader

Take SkinShade 4 and click Copy SH in the material loadout, and open a new Double-Shader and paste SH into the S1 slot. Now for the S1 slot, reduce the Ambient to 10, Diffuse to 60, Spec to 5 and also tighten the specular curve. Add a value of just 0.2 Noise to the curve. Now take the ToyPlastic material and copy the S1 slot into the S2 slot of the Double-Shader we are working with. Reduce the specular of the S2 slot to 5, and then increase the Colorize Specular to 100. Change the spec in the material to a pale, sky blue. For the wax settings: 30 Strength, 0 Spec, 20 Radius.



02 Apply your Shaders

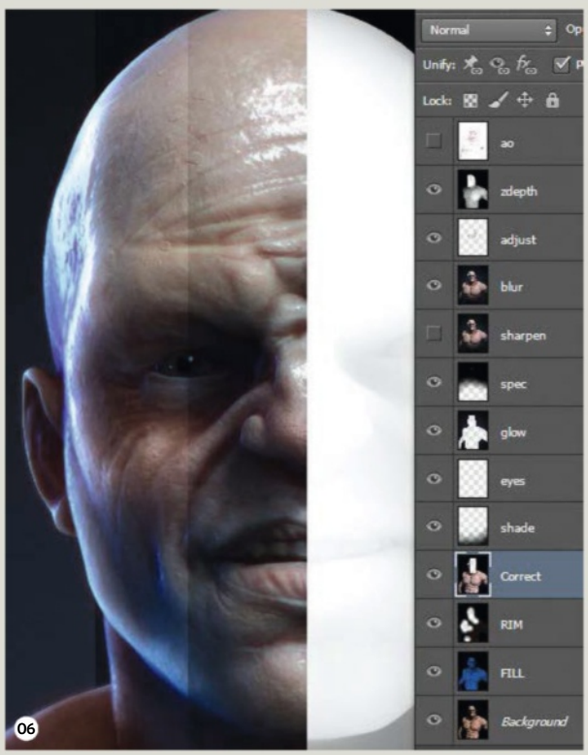
Copy your Double-Shader and paste it into a new slot, so you have Double-Shader1. Increase the specular on both shader slots to 15. This new shader will be for your high spec areas such as lips and sweat. Once you have textured your sculpt, it's time to set up your materials. On each subtool for skin, get any brush and make sure only M is enabled. Now go to Color>Fill Object with the material you want selected, for example Toy Shader for eyes and your Double-Shader for skin. You can then select Double-Shader1 and paint on lip areas and wherever else your model will be wet.

03 Render settings and canvas

In the attached screenshot you will find the settings I use for my renders. I usually keep the AO resolution at half the Shadow resolution to keep renders quick, but be sure to set your resolution at roughly the same as your final output. Next you need to set your canvas up. Go to Document and adjust the Back colour to black, with Rate to 0. Below that, uncheck the PRO button and adjust the sliders to your final render size, then hit resize. Use Ctrl+N to clear the background, then drag your model into view.

04 Lighting and passes

I use a single light for each render, only enabling different ones for rim and fill. My key light is set at 1.5 brightness with default settings. For my rim I usually set a blue hue and to bring it to the back. I click once on the small preview sphere. I drag and angle this so it creates a decent rim. Set this to about 3. I usually create a third, cool light for fill, at about 1. I render each lighting pass out and export them via Document>Export Document. Next export the AO and depth passes from Render>BPR Renderpasses.



ZBrush perspective

ZBrush doesn't use true to life perspective; instead it's quite distorted. Use low levels to zero for sculpting. When rendering, amp up your Angle of View to get the best possible result. Below the floor button is a Local Transformations button, which when enabled will rotate the camera around a certain point on the model. Try disabling this when rendering as it will snap to the world grid centre instead, enabling you to find better angles to view and render your scene.

05 Compose in Photoshop

Open your passes in Photoshop, and copy and paste each one into the first pass. Hide all but fill. Now unhide the rim and set it to screen. This will overlay it over your fill layer. Adjust Opacity and Color however you desire. Next unhide your fill layer and bring it down to a low opacity, and change the colour with Ctrl+U to a cool blue. I usually experiment with levels, colour ranges and opacity to try and find something that looks good. But if I don't have the time, default settings are usually best.

06 Photoshop Composition 2

For your AO pass you can try a few things. I usually increase the levels and set it to multiply to darken those cracks and shadow areas, but I also change the colour with Ctrl+U then click Colourize. You can use the AO pass to create ambient lighting. Set your unaltered layer to Hard Light and reduce the opacity to 5-15%. The best thing is to play around and push each pass to add realism. I take the depth pass, Ctrl+Select the RGB layer in channels and invert that selection to use on the main render. I then use Lens Blur and also add some small noise to really achieve that depth of field.

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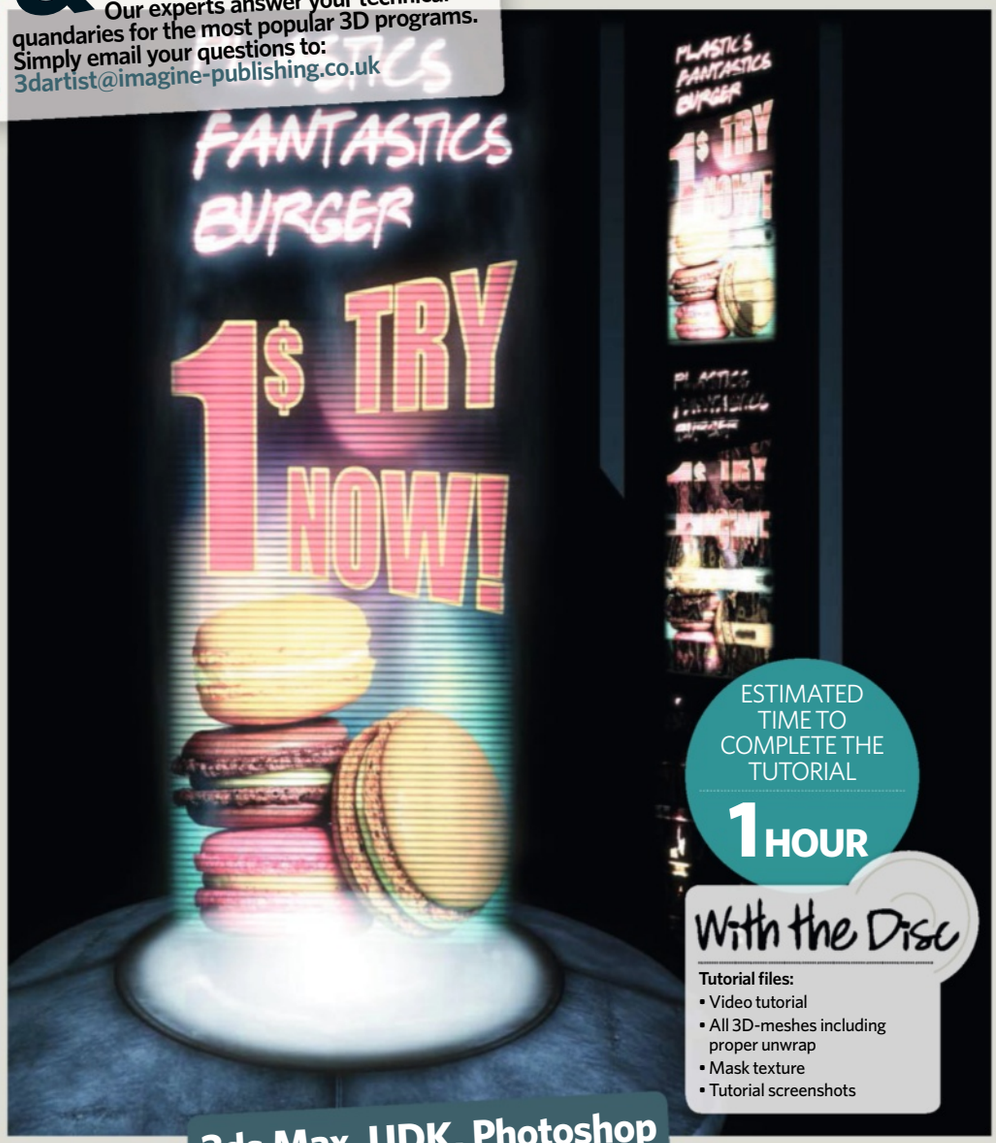


ESTIMATED TIME TO COMPLETE THE TUTORIAL

1 HOUR

With the Disc

Tutorial files:
- Video tutorial
- All 3D-meshes including proper unwrap
- Mask texture
- Tutorial screenshots

3ds Max, UDK, Photoshop

Shader techniques using EPICs UDK

"What's the best way for me to create a realistic, real-time hologram effect in a videogame?"

Inside UDK there is a simple and intuitive material system. It's especially designed for artists and rapid prototyping for a wide range of effects. In this tutorial we will take a closer look at how we can use this system to produce a good-looking hologram effect ready for in-game use.

To do this we will build some simple meshes and unwrap them. Following that Photoshop will be used to paint a couple of tiling textures that will be extensively used to build a bigger shader network. This shader network will allow us to give the player a feeling that this hologram is projected from a device. To reinforce this feeling, a distortion will warp the hologram every couple of seconds.

In total there will be three shader branches connected together at the end of the tutorial. In the first branch we will explore how we can work on the UV input of texture samples to create a nice looking distortion effect. We will make use of nodes such as sine, linear interpolation, time and some mathematical nodes.

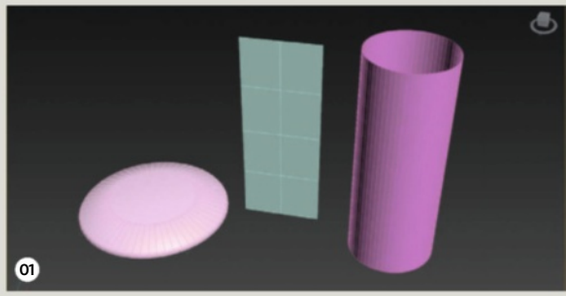
The second shader branch will cover how we can animate textures. At this stage we won't only animate textures but in addition we will also build tiling functions, including scalar parameters that can be manipulated inside a material instance.

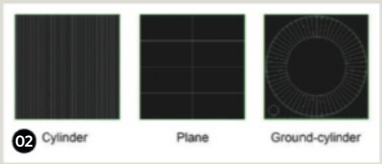
The last branch will cover the integration of the main hologram texture and the connection with the other two branches. We will also consider some small details and functionality, such as desaturation of the texture and adding a fresnel node to highlight spots on the hologram that the player is directly pointing at. Parts of that bigger shader will serve as a base for an effect around the holo surface, which will add a feeling of projection surface distortion on the complete projection space.

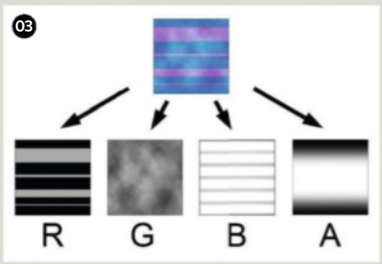
The main goal of this tutorial is to understand basic pipelines like using small tilable masks and nodes to create animated effects inside the material. A secondary goal will be to understand how to create non-linear animated effects. Basically, we will consider how to build a shader branch that will break regularly inside the function to add some dynamic behaviours. With the disc you will find a video tutorial that will further detail the process.

01 Break down your ideas

Think about what kind of hologram effect you want to achieve. In this case we will work on a hybrid between known holograms with a blue-ish touch and futuristic holograms with the full colour spectrum. We need to create three assets in 3ds Max – one projector, preferably on the ground, a plane which will hold the holographic commercial and a cylinder to show distortion around the projector surface. All assets can be kept simple, so we will use a cylinder with deleted top and bottom, a simple plane as the holograph surface, and a scaled cylinder plus chamfer and insets for the projector.







02 Unwrap assets

To unwrap the holo meshes first apply a UVW-Map modifier to each. For the plane choose the Planar Mapping method. The cylinder around the plane needs Cylindrical as the mapping method. To get the best automatic unwrap result press Fit inside the Alignment section. The manner in which the holo meshes are unwrapped effects the setup of the shader setup. One benefit of this automatic method is that the UV space is fully used from 0 to 1. As such, we can easily work with tilable textures and other special masks.

03 Vary textures in one mask

We need to create a set of tilable textures that we can use to animate inside the shader. We can do this by packing four textures inside one mask by using each channel plus the alpha-channel. For the red channel, paint some horizontal stripes in grey, for blue use horizontal stripes with the same size and a bit of Gaussian blur. For green apply a basic noise filter with a bit of blur. For alpha just use a simple brush to paint a black falloff. Now save the map as TGA file and at 32-Bit output.

04 Prepare a solid base in UDK

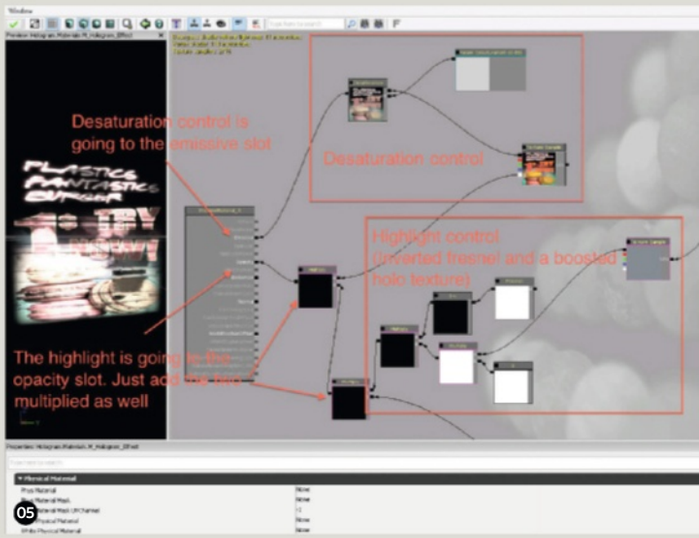
Now it´s time to jump into the UDK and create a new package by clicking New in the content browser. Import your three assets into a subfolder called Meshes. Import all textures into another subfolder named Textures and add another subfolder by creating a new material and call the subfolder Materials. We must create three basic materials – one for the projector, another for the hologram and a last one for the distortion cylinder. Fill them with just one constant node plugged into the Diffuse channel. The materials for both holographs need to be set as additive in the blend mode and unlit as the lighting model.

05 Set up the shader root

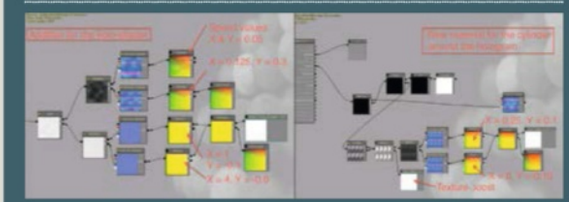
Add two texture samplers. You can add them by searching in the right bar and dragging them into the empty space. Assign a self-made texture to both by right-clicking them and select use current texture. Now add a desaturation and a scalar-parameter (value 0.65) node next to one sampler. Use the upper input of the saturation for the sampler and the percent slot for the scaler parameter. The second small branch needs a fresnel node connected to a one-minus to invert it. This will be multiplied by a second sampler that gets boosted by multiplying it with a constant (value 8).

06 Connect distortion

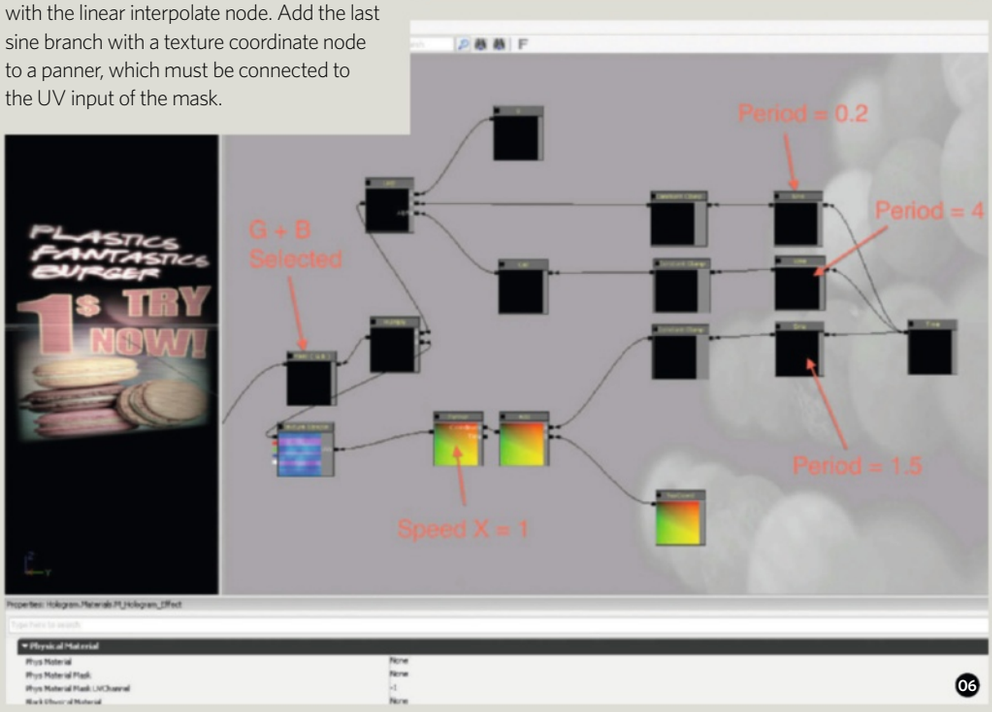
Now add one time node, three sine nodes and three clamp nodes. The sines should be connected to the clamp node and each sine needs a connection to the time node. The first two sine branches need a connection to a linear interpolate node. The first input must be zero, the second input is the first sine branch, and alpha is the second sine branch with a Ceil node in between. The third sine branch will scale the distortion texture. Base is a texture sample node (Mask assigned), which will be multiplied with the linear interpolate node. Add the last sine branch with a texture coordinate node to a panner, which must be connected to the UV input of the mask.


Desaturation control is going to the emissive slot
Desaturation control
Highlight control (inverted fresnel and a boosted holo texture)
The highlight is going to the opacity slot. Just add the same multiplied as well
05

One hint and more effects



Before we connect the distortion to the second texture sampler, we need to add a component mask-node and choose only two dimensions. Let's make four more texture samplers (Mask applied). Multiply always two of them together (for one set the blue channels and the other one use the red channels) and add the result. Behind each sampler will be a panner node for animating the UV space. One sampler with an active green channel needs a texture coordinate node (VTiling 2). Both panners at the samplers with working blue channels will be connected to a scalar-parameter which is multiplied by a texture coordinate node (value 10) for the tiling.



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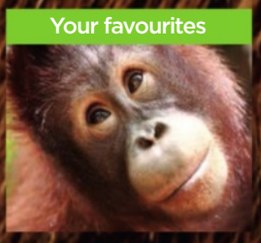

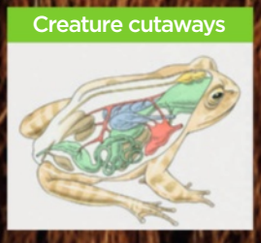

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Artist info

Michael Feuerroth

Website www.feuerroth.de
Country Germany
Software used 3ds Max, Photoshop, V-Ray, Marvelous Designer
Bio Michael Feuerroth is a media artist based in Germany, specialising in arch-vis and photography

Ouverture 2013

Project Ouverture is an art project from Atelier Feuerroth that has recently been awarded many well-known international awards and was nominated for Best Still 2013 at the Animago Conference. Ouverture, a contemporary white attic space, has been developed from scratch from sketches and colour moods through to the final rendering.

> The cloth in the scene was made with Marvelous Designer. The sheep hide rugs were made with 3ds Max in the native Hair and Fur modifier. It was important to set the clumping parameter here

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The Replicator 2 was specifically designed to be the MakerBot's easiest tool for creating professional quality models; aimed for the desktop of both professionals and amateur designers

MakerBot Replicator 2

The 3D Artist team test drives MakerBot's Replicator 2 to discover why it has remained one of the most popular printers sold

REVIEW BY Larissa Mori, 3D Artist magazine

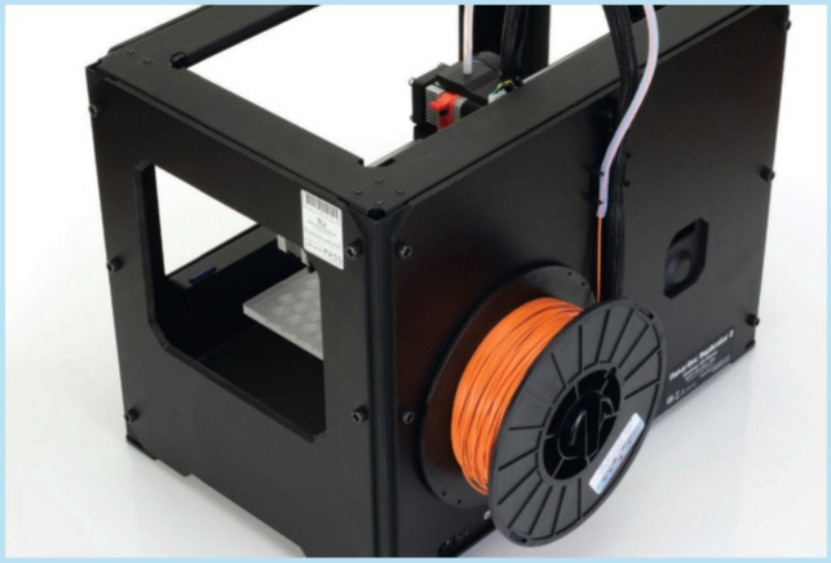
MakerBot's fourth generation 3D printer release, the Replicator 2, has not only been one of the most consistently popular printers sold since it was introduced last year, but it also earned the company – and arguably 3D printing itself – an increasingly widespread fame and market share. When the Replicator 2 was first launched, the printer impressively made it onto the front cover of *WIRED*, and MakerBot has even been called the Apple of 3D printers.

Looking at the Replicator 2 it is easy to see why. The carefully considered construction and design of the printer is immediately apparent; its steel frame is both very strong and durable, allowing it to easily withstand high 3D printing speeds with its 11.5kg weight. The unintimidating aesthetics of the Replicator 2 also help separate it from its competitors – it didn't look out of place in an office and could easily even be a stylish addition to a home environment. The Replicator 2 was also relatively quiet compared to other 3D printers, with its futuristic noises easily drowned out by the background noises of the workplace.

Of course, the Replicator 2 also offers many significant improvements over to MakerBot's first Replicator, including a volume up to 37 per cent larger, allowing prints of up to 11.2 L x 6.1 W x 6 H in. The Replicator 2 is also far more user friendly, not just in looks but also in functionality when compared to its predecessor. The printer includes a control panel with an LCD screen that provides print status information, control menus and diagnostics, as well as a USB and an SD drive so that users are able to print without needing to be connected to a computer at all. This is a huge advantage for the 10-hour long prints required of larger, more complex objects.

MakerBot MakerWare, the software specifically developed to prepare models for printing on the Replicator 2 and other MakerBot printers, has also been designed to provide similar flexibility. Multiple models can be dragged and dropped into one scene for more efficiency when printing them all at once, and more advanced users can

Every MakerBot Desktop 3D printer is assembled and tested by skilled labour in MakerBot's Brooklyn, New York factory



The Thingiverse website allows users to contribute their designs for others to print and to download models themselves, including improvements to their own printers like a spool dispenser to prevent tangled filaments

experiment with the layer resolution – which is already over two times finer than the first MakerBot Replicator at 100 microns – to push it down to as fine as 20 microns.

The choice of colours that go into each print is no different, with the option to create objects out of everything from translucent yellow to glow in the dark materials. Curiously, MakerBot has made one main restriction on the Replicator 2 compared to its predecessor, in that the Replicator 2 has only been optimised for use of PLA as apposed to both PLA and ABS plastics. However, the company has also said that the PLA filament is more reliable with the printer, saving up to 32 per cent in energy costs compared to when printing with ABS.

Another aspect of the Replicator 2 to be aware of is that although the printer is certainly user friendly compared to many other 3D printers, it is still a machine and will require maintenance. Though it has been marketed as working straight out of the box, for example, the Replicator 2 still required time-consuming precision to set up elements needed to level the build plate properly before we could start to print. Luckily, MakerBot is one of the most helpful printing companies out there in terms of its user base and support. Anyone who buys a Replicator 2 will receive support six days a week, as well as access to reference videos, tutorials, documentation, the MakerBot community and the Thingiverse model-sharing website.

Essential info

Price: from $2,199 US

http://store.makerbot.com/replicator2.html

OPERATING SYSTEMS

- Windows XP 32-BIT/7+
- Mac OS X (10.6+)
- Linux (Ubuntu 12.04+)

BUILD VOLUME 28.5 L X 15.3 W X 15.5 H cm
LAYER RESOLUTION 100 Microns [0.0039 in]
NOZZLE DIAMETER 0.4mm
PRINT TECHNOLOGY Fused Filament Fabrication
PRODUCT WEIGHT 11.5kg

OPTIMAL SYSTEM REQUIREMENTS

- Software bundle MakerBot MakerWare
- Connectivity USB, SD Card (both included)
- Power requirements 24 V DC @ 6.25 AMPS
- Operating Temperature 15-32 degrees Celcius
- File Types stl, obj, thing

PLA is harder, less high temperature resistant and more brittle than ABS, but is biodegradable, available in a wide range of colours and translucencies, and seems to have higher maximum printing speeds, lower layer heights, and sharper printed corners

The good & the bad

- ✓ LCD control panel
- ✓ SD card and USB drive
- ✓ Printing multiple models simultaneously
- ✓ Well-designed steel frame
- ✓ 6 days a week MakerBot user support
- ✗ Optimised only for PLA
- ✗ High price
- ✗ MakerBot accepts returns on a very limited basis

Our verdict

Features	9/10
Ease of use	6/10
Quality of build	8/10
Value for money	7/10

"A great choice if you want a very well designed, professional quality printer"

Final Score 8/10

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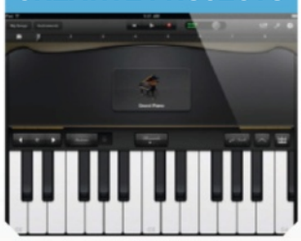

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15-inch Apple MacBook Pro with Retina Display

Apple's high-end MacBook Pro with Retina Display has a discrete 3D card to provide it with rendering performance

REVIEW BY **Orestis Bastounis,** technology and software writer based in the UK

The high-end configuration of Apple's 15-inch MacBook Pro is the only model that has a discrete graphics card; an NVIDIA GeForce GT 750M with 2GB of video memory, and in addition, an integrated Intel Iris Pro GPU with its own 128MB of EDRAM. This makes it the only portable Mac that can compete with other mobile 3D workstations.

As laptops go, it's stunning. The entire 1.8cm aluminium chassis is thinner than the lids of some PCs, while the 2,800x1,800 IPS Retina display makes text appear unbelievably sharp. You'll be amazed when you first see it.

However, for 3D, braun matters more than beauty, so we put aside our admiration of the MacBook Pro's aesthetics when investigating its rendering performance. It has everything in the right place. There's 16GB of 1600MHz DDR3 memory and a quad-core Intel Core i7 4850HQ processor. This chip runs at 2.3GHz, rising to 3.5GHz when under load.

It has 802.11ac Wi-Fi, which is capable of roughly five times the speed of 802.11n, and a 512GB PCI-Express SSD, which managed 763MB/sec transfer rates; faster than any SATA SSD.

There's also a minimal, but sufficient array of connectors. HDMI 1.4, which is capable of 4K output, two display port/Thunderbolt ports and two USB 3.0 ports.

You can't configure the MacBook Pro with a Quadro or FirePro card as you might a workstation from Dell or HP, partly because the thin 15-inch chassis limits the maximum TDP of the components Apple can use inside it. You can't open the laptop to install new memory, upgrade its storage, or replace its battery either, and we'd recommend purchasing AppleCare extended warranty.

GeForce graphics cards are optimised for gaming rather than professional 3D. But with the Iris Pro included as well, the MacBook Pro can accelerate both OpenCL and Cuda software. OS X switches between the cards automatically, but you can force a card to be used with third-party software (such as the nifty gfxCardStatus).

Under OS X, the MacBook Pro was a good performer, when compared with other 15-inch laptops. Its Cinebench GL score beat Dell's M4700 15-inch workstation.

We installed Windows via Bootcamp to test 3ds Max and other software. Unless you increase the DPI in Windows, the desktop appears at its native resolution, with minuscule icons, text and images, unlike OS X, where everything is displayed at 2x res.

We measured some excellent render times in our 3ds Max 1,080p test, thanks to the high turbo frequency of the CPU. SpecViewPerf scores were low though, since a mobile gaming GPU simply can't match the performance of a professional card.

The MacBook Pro isn't intended to be the last word in 3D modelling hardware, so don't expect that. But it does at least run 3D software well, so if you love using Macs, this configuration is your best portable option.

The 15-inch MacBook Pro with Retina display is a fantastic laptop that has what it takes to run 3D software

Essential info

Price: £2,199 / $2,599 US*

http://www.apple.com/uk/macbook-pro/

OPERATING SYSTEMS

- OS X 10.9 (Mavericks)

TECHNICAL SPECIFICATIONS

- Intel Core i7 4850HQ (2.3GHz)
- 16GB 1600MHz DDR3L memory
- GeForce GT 750M GPU
- Intel Iris Pro GPU
- 512GB SSD
- Broadcom three-stream 802.11n Wi-Fi
- 2800x1800 Retina display

The GeForce GT 750M is a respectable mobile GPU but doesn't match Quadro or FirePro cards

The good & the bad

- ✓ Beautiful, thin aluminium design
- ✓ 15-inch high resolution Retina IPS display
- ✓ Fast processor
- ✓ Dual graphics cards
- ✓ Fast networking and storage
- ✗ GPU better for gaming than professional 3D
- ✗ Limited expansion options
- ✗ Three-year warranty costs extra
- ✗ Windows desktop appears with tiny text in Bootcamp

Our verdict

Features	8/10
Ease of use	9/10
Quality of build	10/10
Value for money	7/10

"Although the 15-inch MacBook Pro isn't our first choice for mobile rendering, it gets the job done"

Final Score 8/10

*Price conversion correct at time of printing

Houdini 13 now supports ILM's OpenEXR 2 format, which allows deep compositing of Mantra renderings

Houdini 13

The latest version of this procedural animation package comes with tons of new features and performance enhancements

REVIEW BY Gustav Melich, FX technical director, USA

Side Effects Software has released the latest version of its 3D animation and visual effects package, bursting with a wealth of new and enhanced features.

Firstly, there's the Finite Element solver, which analyses the stresses on solid objects, then either bends or breaks each shape. This new solver is ideal for creating destruction shots or soft body FX with volume preservation. It is fully integrated into the dynamic context and can interact with all the other solvers. Impressively, it enables the user to create much more realistic fracturing and destruction effects, more so than what the software was already fully capable of.

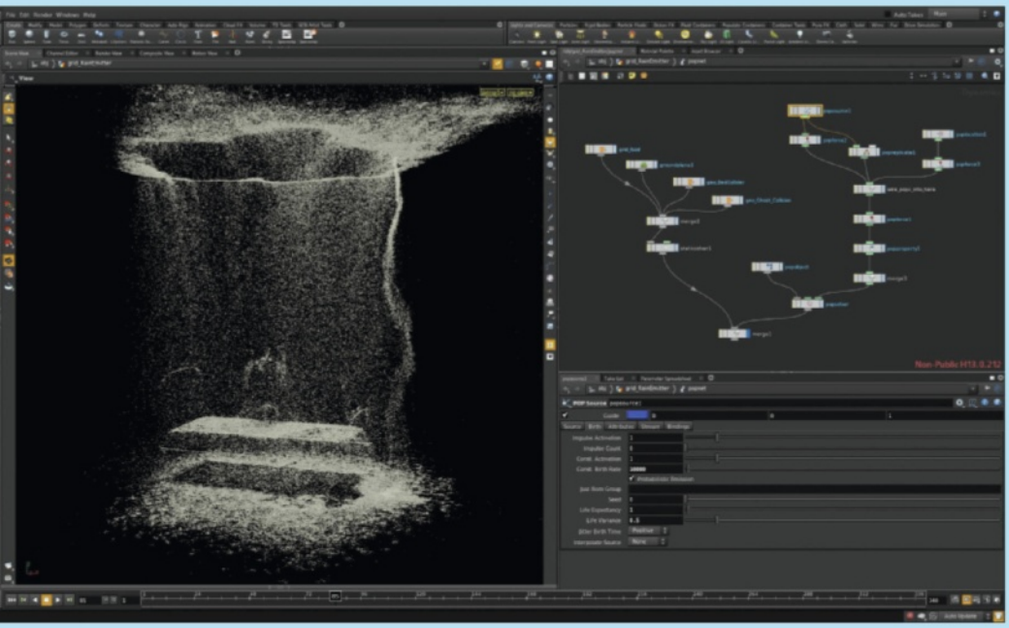
The tools on the new Solid Shelf tab allow the user to create and work with solid objects, organic tissue, fractured solid objects and different types of colliders. For collision there is the choice between volume-based collision, which uses signed distance fields (SDF), or geometry-based, which supports both polygons and tetrahedrons. The geometry-based collisions use continuous collision detection, so that the collisions will be detected reliably even when objects move at high speeds.

The new proxy workflow allows the user to deform and fracture more detailed hi-res geometry along with a lower-resolution simulation geometry. The lo-res geometry can then be used for simulations and the higher resolution geometry for rendering.

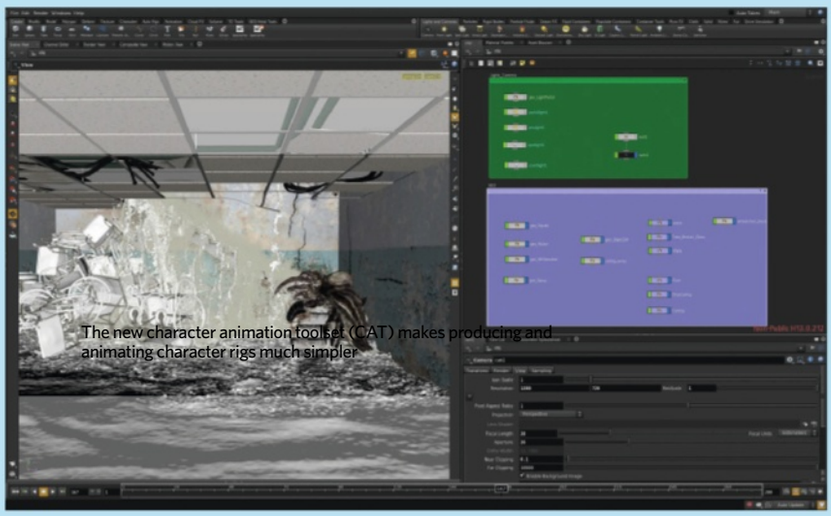
The new particle architecture has been fully integrated into the dynamics context as a series of microsolvers to provide seamless interaction with other simulation tools. It is fully multi-threaded and VEX based, which allows for speeds up to 10x faster as well as cached results for scrubbing back and forth in the timeline. There are also a big set of new particle tools and forces, including Axis Force, which uses 3D volumes to control particles, Point Attract, Curve Attract, Curve Force, Flock and many more. The user can utilise the tools on the new Particles shelf tab to set up and manipulate these new particles. The new particle nodes can be used to manipulate the fluid particles in FLIP fluids and the objects in the Bullet RBD solver.

Houdini 13 also offers an exciting new lighting workflow. This has been built around the use of ILM's and Sony Imageworks' Alembic format and the Houdini's new primitive type, Packed Primitives, as a way of efficiently managing large datasets. This new workflow offers a new data tree view for working with the Alembic files and assigning materials and lights to the objects and groups. This new workflow is linear out of the box and combined with improvements to Mantra's quality and performance offers a powerful and reliable lighting solution. In production pipelines these new toolsets will offer a robust solution, making the Mantra renderer a very feasible option.

In this release the Bullet solver has also been further enhanced, being faster, more



The new multi-threaded particle architecture allows the user to simulate many more particles much faster. The cached result can be played back by scrubbing in the timeline



The new character animation toolset (CAT) makes producing and animating character rigs much simpler

The new Finite Element solver allows the user to simulate softbody effects with volume preservation. It is fully integrated into DOPs, and can work easily with the FLIP solver

accurate and memory efficient. The majority of the performance and memory usage improvements come from the new multi-threaded solver. Now, Bullet simulations can be interrupted with progress shown in the status bar. The solver supports most geometry types out of the box, it is capable of operating on points and it can utilise the new packed primitives type for quick and easy instancing of geometry. There are also new shelf tools to help the user manage the Bullet solver more efficiently. The Voronoi fracture tool is about twice as fast, and the Voronoi Fracture solver is also improved when handling large numbers of impacts.

Finally, the FLIP Fluid and Ocean FX tools continue to evolve. The water behaviour offers more realistic results because of improved velocity extrapolation with better accuracy around the surface. When controlling fluids, users can now use POP-style forces and other dynamic operators. The new particle fluid surfacer is much faster, and produces less noise in the final results. The new Ocean FX shelf tab contains useful ocean rigs, and there is a new Ocean Surface Material, which gets assigned automatically to the ocean geometry. There is also a new Mist Tool that uses a Gas Mist Solver to create a fine spray from a FLIP simulation. It is finer than Whitewater, and behaves more like smoke, as the particles get pushed around by the air.

Overall, this is an impressive and sturdy update to what is already one of the most reliable simulation tools on the market. For anyone already using Side Effect's software, upgrading is a no-brainer.

Essential info

Price: Houdini $1,995 USD / Houdini FX $4,495 USD / Houdini Apprentice HD $99 USD/year / Houdini Apprentice Edition Free

www.sidefx.com

OPERATING SYSTEMS

- Windows XP or Windows 7 (32 or 64-bit)
- Mac OS X 10.6 or higher
- Linux

OPTIMAL SYSTEM REQUIREMENTS

- Recent generation 32 or 64-bit AMD or Intel processor (64-bit strongly recommended)
- Minimum 4GB RAM / 8GB recommended for fluid simulations
- 64-bit Operating System recommended
- Minimum 1GB disk space
- 3 Button mouse required

The improved Bullet solver is significantly faster and more accurate. Now it supports most of the geometry types out of the box and is capable of operating on points

The good & the bad

- ✓ New multi-threaded particle architecture fully integrated into DOPs
- ✓ New Finite Element solver
- ✓ Linear lighting workflow to handle huge datasets
- ✓ Support for OpenEXR 2 and OpenSubdiv
- ✓ Faster and more scalable Bullet solver
- ✘ Lack of documentation and example files
- ✘ Not the easiest of software for new users

Our verdict

Features	9/10
Ease of use	7/10
Quality of results	9/10
Value for money	9/10

"With Houdini 13, Side Effects continues to do what it does best, offering many tools we've been dreaming of for a long time"

Final Score 9/10

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Inside guide to industry news, studios, ion and education

102 News
Industry news
Stay abreast of the latest developments and software releases

104 Studio access
Reel FX
We find out more about how Reel FX created *Free Birds*, its very first feature length animation

108 Project focus
Axis Animation
Axis co-founder Richard Scott sheds light on the pipeline behind the *Fable Legends* trailer

110 Industry insider
Fausto De Martini
Fausto De Martini talks about his work on game cinematics and as a senior illustrator

inside

> We've come a long way, from being two guys in a garage who worked in commercial post-production to where we are now

Kyle Clark, chief operating officer at *Free Birds* creator Reel FX. Page 104

Free Birds
Reel FX
We talk to Reel FX about producing its first feature length animation, *Free Birds* – the story of two turkeys who travel back in time to get themselves off the Thanksgiving menu

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For customers requiring access to high-speed Ethernet, every M3800 is equipped with a USB to RJ-45 dongle. It also has four USB PowerPorts and multiple external monitor support with the optional Dell D3000 USB 3.0 Docking Station

The Dell Precision M3800 is available with Windows 8.1 Pro (64-bit) or genuine Windows 7 Professional (64-bit)

Dell announces new mobile workstation

Dell has revealed its new ultra-thin and light 15-inch mobile workstation: the Dell Precision M3800

Initially showcased as a prototype at SIGGRAPH, Dell's new M3800 has been launched, with Dell announcing it as the world's thinnest and lightest 15-inch true mobile workstation, at only 18 millimetres thin and starting at 4.15 pounds.

Designed to be used for anything from video editing to rendering 3D animation and modelling on the road, the Dell Precision M3800 offers some impressive technical specs, with up to 16GB of memory and a fourth-generation Intel Core i7-4702HQ 8 threaded quad-core processor, with up to 3.2 GHz clock speeds. The workstation also features the NVIDIA Quadro K1100M GPU with 2GB of GDDR5 dedicated memory for graphics-intensive software applications, as well as dual cooling, with twin fans across the CPU and GPU to enable maximum performance.

"The M3800 from Dell is elegant and incredibly powerful for its size," says Matthew Doyle, technical marketing specialist at Autodesk. "My work looks amazing in the DirectX 11-capable viewport inside Maya, at a whopping 3,200 x 1,800 screen resolution. Working with Mudbox using the touchscreen controls is also really nice. It's fast, ultra-quiet and has more than enough horsepower for my needs."

The Dell Precision M3800 has up to around ten hours of battery life, depending on the amount of usage. It also comes with multiple storage configurations, including up to two storage devices with a maximum of 1.5TB of storage (HDD, SSHD, or SSD), one 2.5-inch drive and one solid-state Mini-Card storage device (mSATA).

The Dell Precision M3800 is now available on general sale to purchase worldwide at a starting price of £1,149. You can learn more at www.dell.co.uk/speedoflight.

The M3800 joins the M4800, M6800, M6700 and M4700 Dell Precision workstations

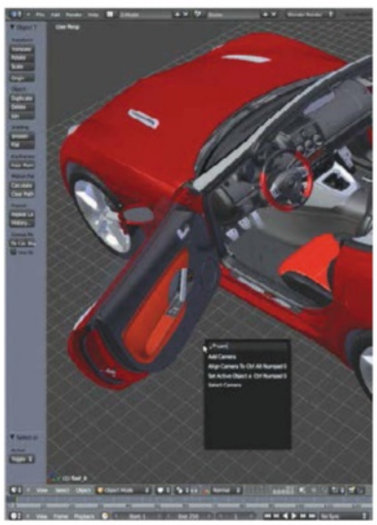
Blender 2.69 released

Following the 2013 Blender Conference in October, The Blender Foundation releases Blender 2.69

The Blender Foundation and online developer community has announced the launch of the new Blender 2.69, which fixes over 270 bugs that existed in previous versions. The new update includes features such as FBX import capabilities, a Mesh Bisect tool to cut detailed meshes in half, Cycles Subsurface Scattering and hair shading improvements, as well as a more accurate sky model for sky rendering.

The update follows the latest Blender Conference in October, which included talks about improving Blender's UI; developing artistic tools and infrastructure for 3D printing; using Blender to create manga and comic styles; and using a Kinect and the Oculus Rift within the Blender Game Engine, among others.

Find out more about the new update at tinyurl.com/3DAblend2-69, or watch the Blender Conference presentations, including an introduction by Ton Roosendaal online at www.blender.org/conference/presentations.



The latest version of Blender has seen yet another swathe of bug fixes, as well as a wealth of new workflow-enhancing features
© Blender Foundation – **www.blender.org**

● HAVE YOU HEARD? ▪ Apple releases its cylindrical Mac Pro workstation this December, with prices starting at $2,999

Disney tries hybrid 3D

The House of Mouse tests a new trifocal camera that could eliminate the need for greenscreens

Disney's VP of production technology Howard Lukk has revealed that the studio recently completed a three-day shoot testing a trifocal camera system, which would enable a typical film shoot to also generate information for use in post-production, without classic stereo conversion.

The new system, which was developed by the Fraunhofer Heinrich Hertz Institute in association with Walt Disney Studios and camera-maker ARRI, uses a camera rig that includes an ARRI Alexa main camera as well as two small IndieGS2K satellite cameras to capture RGB images fused with depth maps, generating the stereo content with minimal on-set effort. The distance between the camera and an object would be calculated in the shoot, potentially without requiring greenscreen.

At IBC 2013, ARRI also presented a second similar prototype camera with the ARRI ALEXA SCENE. Dr Johannes Steurer, ARRI's principal research and development engineer, said: "Compositing, colour-grading, keying and many more post-production tasks can be facilitated by our new camera. It provides cutting-edge, high-resolution RGB images with synchronised depth maps, which are taken through the same lens and hence feature a parallax-free 3D image of the scene."

Software shorts

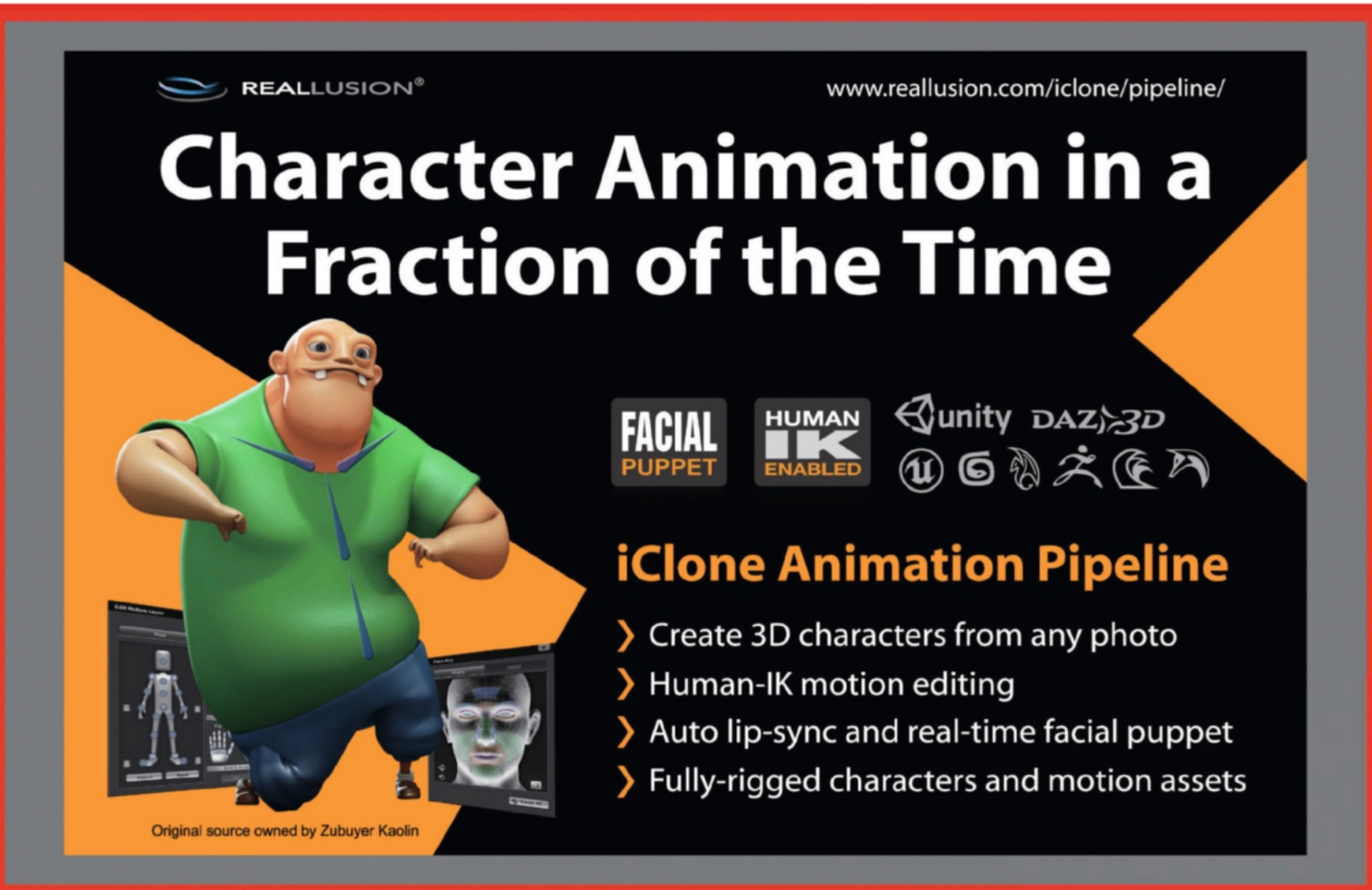
Bringing you the lowdown on product updates and launches

LightWave 11.6, NevronMotion and ChronoSculpt

After announcing the software at SIGGRAPH, NewTek has released LightWave 11.6, which includes motion-capture plug-in NevronMotion, enabling users to capture, adjust and retarget motion data to 3D models inside LightWave with Microsoft's Kinect. The company has also released new time-based tool ChronoSculpt as a standalone app. More info can be found at www.lightwave3d.com/products.

LumenRT 4.3

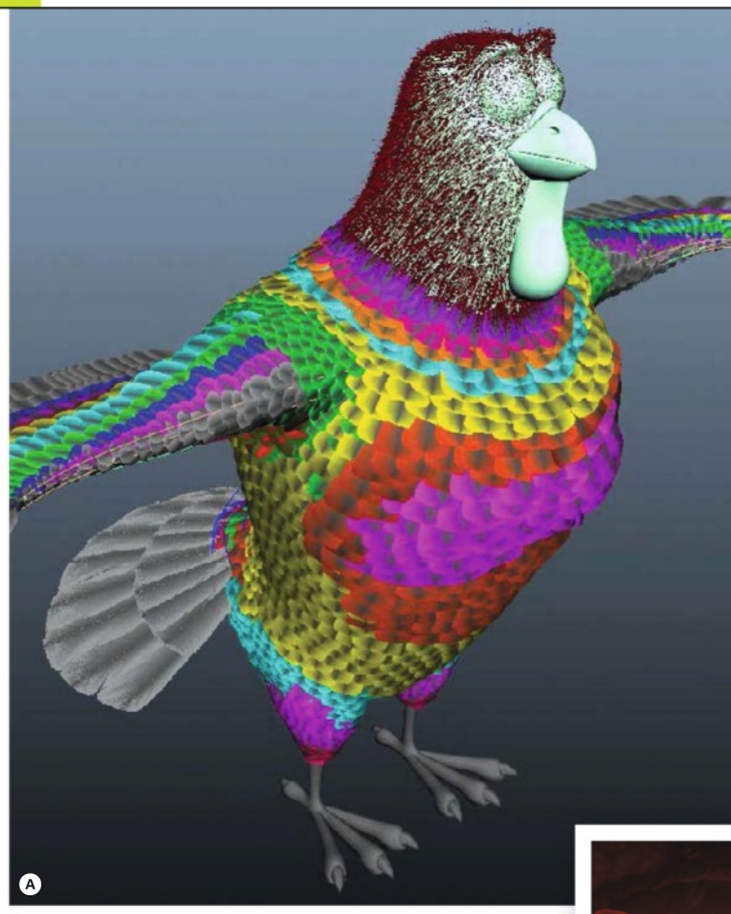
E-on software has announced LumenRT 4.3, which will be available as a free upgrade for all LumenRT 4 Studio users. It includes a new content library containing over 80 new, real-time optimised plants based on e-on's Plant Factory technology, enhanced SketchUp content, an improved GeoDesign plug-in and more. Learn more at www.lumenrt.com/customercare.



Studio Access

The new kid on the block

We talk to animation studio Reel FX as it moves into the world of film with Free Birds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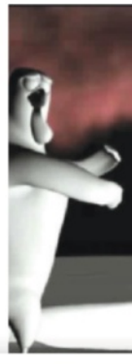


Dia de los Muertos, or the Day of the Dead, is undoubtedly set to become more popular in animation in the near future, with the Mexican tradition acting as the cultural backdrop to two major animated films by 2015. In fact, earlier this year Disney faced a significant backlash after attempting to trademark the term 'Dia de los Muertos' for the merchandising of Pixar's upcoming untitled animation about the holiday, which will be directed by *Toy Story 3*'s Lee Unkrich and is scheduled for a 2015 release date. Meanwhile, next year marks the release of *The Book of Life* – a *Romeo & Juliet*-inspired love story set during the Day of the Dead celebrations. Produced by Guillermo del Toro, *The Book Of Life* will only be the second feature-length film the newcomer animation studio Reel FX will have ever created. Impressive stuff.

Despite being new to the world of feature animation, however, Reel FX is a studio that aims to be remembered. Founded in 1993 by Dale Carman and David Needham in Texas, the business began with a focus on commercial and short-form projects, slowly building up the pipeline, tools and team of talented artists towards the goal of one day being able to produce its own feature-length animation. This aim was achieved when, after having celebrated its 20th anniversary, Reel FX finally released its very first animated movie, *Free Birds*, earlier this year.

"I know in the industry that there was a period in the Nineties when studios were just jumping into the animation game left and right; everybody wanted to make an animated film," begins *Free Birds*' directing animator Ray Chase, who has worked at the studio since 2006. "I think Reel FX went about it the right way. They sort of took their time and forged a lot of relationships with other studios. For the seven years that I've been here we've worked for DreamWorks and we've done stuff for Sony, so I think we felt really good at the beginning of *Free Birds*. We were ready to do this."

A Thanksgiving-themed buddy comedy with a sci-fi twist, *Free Birds* tells the story of Reggie, a turkey voiced by Owen Wilson who wants more from life than the complacent family owned farm he lives in can offer. An outsider among the other turkeys on the farm, his life is suddenly changed when, after the President of the United States lands him

> "The great thing about Jimmy Hayward was that he was an animator himself – he worked at Pixar for a number of years and that worked out really great for us"
>
> **Ray Chase,** directing animator on *Free Birds*

B

A Proprietary tool Avian was created specifically for use on further projects. Here, Sawyer's team used it on everything from the feathers on turkeys to dog fur and the hair on human heads

B Before *Free Birds*, the Reel FX team worked on projects such as *Open Season 2* with Sony and a series of *Looney Tunes* shorts for Warner Bros., as well as advertising work

REEL FX ANIMATION STUDIOS

Reel FX was founded in 1993 by Dale Carman and David Needham in Fort Worth, Texas, focusing mainly on commercials and short-form projects. *Free Birds* is the first feature-length film to be produced by Reel FX in Dallas, Texas, with support from its Santa Monica location.

www.reelfx.com

Country USA

Project *Free Birds*

Description *Free Birds* is the story of two turkeys from opposite sides of the tracks. They must put aside their differences and travel back in time to change the course of history and get turkey off the Thanksgiving menu for good.

Software used Maya, PRMan, Photoshop, NUKE, MODO, in-house proprietary software such as Avian

Contributors

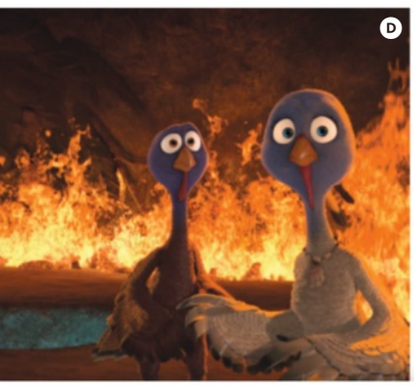
Kyle Clark
Chief operating officer

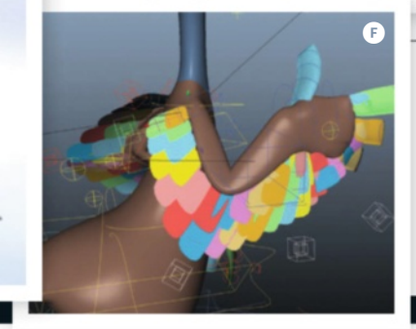
Ross Moshell
Director of business technology

Dave Esneault
Digital supervisor on *Free Birds*

Ray Chase
Directing animator on *Free Birds*

Monika Sawyer
Feather and fur supervisor on *Free Birds*





Creative freedom

Ray Chase discusses the experience of working with Jimmy Hayward as a director, who was previously an animator himself on features such as *Toy Story*, *Monsters, Inc.* and *Finding Nemo*

Throughout the production of *Free Birds*, the whole Reel FX department was purposefully structured so the animators and artists had the ability to bring their own ideas to Jimmy Hayward directly. "We didn't want them to have to go through eight bosses before getting to the director," says Chase. "There were three different times throughout the day when the animators had access to the supervisors or the directors to get feedback or to show their shot." Hayward was also eager to inject a live-action feel to the way cameras were used, and use a cold colour palette for the sci-fi human environments compared to the warmer fall-coloured turkey environments.

the esteemed honour of Pardoned Turkey and a new life of luxury, he is kidnapped by Jake (Woody Harrelson), the relentless founder – and only member – of the Turkey Freedom Front. Together, they hijack a secret government lab's time machine back to 1621, just days before the first Thanksgiving, on a mission to take turkey off the Thanksgiving menu for good.

This wasn't always intended to be the plot, however. Though Reel FX's years of preparation were a huge advantage, making a feature animation did not come without its challenges and in 2011 a change in directors meant the story had to be almost completely rewritten. "We were still doing this feature of 1,800-plus shots, but we had way less time to do it, so we had to figure out how to maintain the look and quality, but still get the new story executed in the short amount of time," begins the digital supervisor on the film, Dave Esneault. After 15 years of experience at Blue Sky studios and having worked on the first *Ice Age* movie, Esneault was first recruited to work on the film by *Free Birds*' new director Jimmy Hayward, who he had worked with once before.

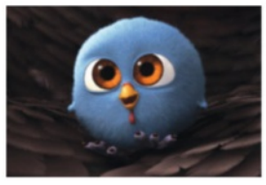
"The great thing about Jimmy was that he was an animator himself – he worked at Pixar for a number of years, and that worked out really great for us because he speaks the lingo and understands the challenges," explains Chase. "He was also really great about letting the animators explore a bit and getting their ideas up

C The digital side of production occurred over a 12 to 14-month cycle. During pre-production, artists developed storyboards before editors cut them together into story reels

D "We had an acting room, where the animators were required to shoot themselves acting out a reference for each shot," explains head of technology Ross Moshell

E The layout department used 3D software to arrange assets and cameras. Animation then brought the character assets to life before lighting delivered the rendered frames

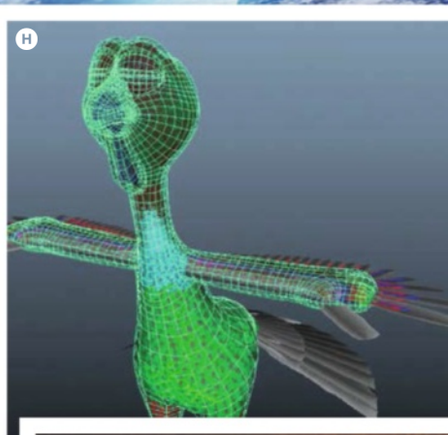
F The studio also offer the Reel FX University initiative, wherein artists can apply for a RFXU paid apprenticeship and spend six months at Reel FX in Santa Monica or Dallas



on screen. As long as things were pretty much hitting the emotional beats that he wanted, he was happy." For Hayward, one of the crucial aspects of creating the fully key-framed animation for the film was for the team of animators to shoot references of themselves. "He would do a kick-off for a sequence and tell the team what he wanted, then we would go off and shoot reference of ourselves acting out the scenes, then get that back in front of him," Chase continues. "That was a very creative way for us to very quickly get ideas in front of him before we spent a lot of time blocking out the shots and going through the animation process."

Another recruit from Blue Sky was feather and fur supervisor Monika Sawyer, who explains that creating the feathers for the 96 turkey characters in *Free Birds* was one of the biggest successes for the team. "Jimmy was really specific about the design of the characters. We went through a lot of pre-vis and character reference," she begins."He wanted to make sure the turkeys could use their hands and that they had strength, but he didn't want them to look like a pair of guys in turkey suits. That was a challenge for us, figuring out how hands and feathered wings would animate." Using Maya as their main 3D package, the team developed the in-house plug-in Avian specifically for *Free Birds* to deal with the groom and shape of the feathers – something that will be useful for their future work. After 20 years of experience building up to creating features, in fact, Reel FX aims to release one animated film every year after *Free Birds*, and are already deep into the production of *The Book Of Life*.

"We built this amazing facility of talented people, and they got to work on *Free Birds*, and after a break they get to work on the next film, *The Book Of Life*, and that's the most important thing; we've really got so many talented people already working on the next movie," says COO of Reel FX, Kyle Clark. " We're very proud of it – we worked very hard to build a studio with the right features and the right people to do this. It's a big milestone for us. We've come a long way, from being two guys in a garage who worked in commercial post-production to where we are now."



G One of Reel FX's strategies will be to ensure that their films don't have the same look as *Free Birds*, but instead have aesthetics that match the tone of the director's vision

H "I was at Blue Sky when they did *Ice Age*. It was similar, although here it was more working on the tools and scalability of a feature as opposed to a short-term project," Esneault explains

I "Even Jake and Reggie are completely different when it comes to the feather grooms, so proprietary was the way for us," says feather and fur supervisor Monika Sawyer

J Main character Reggie gets beaten up quite a bit throughout the movie. "That was a lot of fun for the animators, because they got to exaggerate a little bit more," explains Chase

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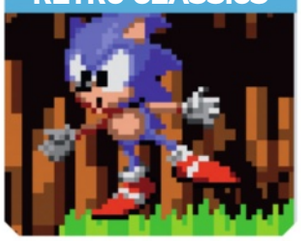

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Project Focus

Fable Legends

Axis co-founder Richard Scott sheds light on the creative process behind this next-gen trailer and discusses the studio's rise to prominence

Project *Fable Legends* debut trailer

Description The *Fable Legends* debut trailer for Xbox One premiered at gamescom in Cologne, Germany. In the announcement trailer, Axis and trailer director Ben Hibon take you back to Albion, a world of magic, humour, adventure, thrilling stories and exceptionally memorable characters.

Country UK

Bio Axis is an animation studio with clients in all areas of the entertainment and marketing industries, including videogames, commercials, film and television. The studio is based in Glasgow, UK and comprises a mix of directors, artists, producers and technical crew recruited from all around the world.

Website
www.axisanimation.com

Axis Animations latest videogame trailer marks the Glasgow-based studio's fifth successful trailer this year. The studio has also recently worked on the likes of *Halo, Dying Light, Aliens: Colonial Marines* and *Infinity Blade: Origins*, as well as the successful *Halo 4: Spartan Ops* series. Just how do they do it? "As a company we've put more and more focus on telling compelling stories as well as creating amazing visuals," begins Axis co-founder Richard Scott, who tells us that Axis is still run by artists as it was when it was founded in 2000. "We were given an outline idea from the client, which we then passed to our directors. Our treatment came from director Ben Hibon: 'The trailer explores our universal desire to play as the hero – our instinctive inclination to choose the good side, but then asks the question: what if the villain had been running the show all along?'"

As always, with the *Fable Legends* trailer the Axis team invested a lot of time in pre-production, during which Hibon completed the storyboarding for his idea and created 2D animatics, while the rest of the group worked on concept art and a colour script to define the lighting and look for all the shots. "At the same time we were building assets in MODO and ZBrush and used our procedural rigging tools in Maya to give the animators the control they need," explains Scott.

> "The trailer explores our universal desire to play as the hero… but then asks the question: what if the villain had been running the show all along?"
>
> **Richard Scott,** co-founder of Axis

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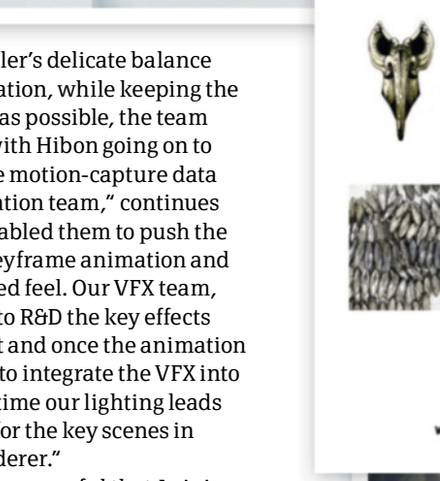
In order to deliver the trailer's delicate balance between realism and stylisation, while keeping the animation work as efficient as possible, the team turned to motion capture, with Hibon going on to direct the actors on set. "The motion-capture data was then used by our animation team," continues Scott. "Our rigging setup enabled them to push the performances further via keyframe animation and really develop a more stylised feel. Our VFX team, working in Houdini, began to R&D the key effects required early in the project and once the animation was in progress they began to integrate the VFX into the final shots. At the same time our lighting leads were doing lighting setups for the key scenes in Houdini and its Mantra renderer."

This pipeline has been so successful that Axis is now proud to call itself one of the UK's fastest-growing animation studios, having won the Imagina Grand Jury Prize and a Best Animation BAFTA for its



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Contributors

Richard Scott
Co-founder

Ben Hibon
Director

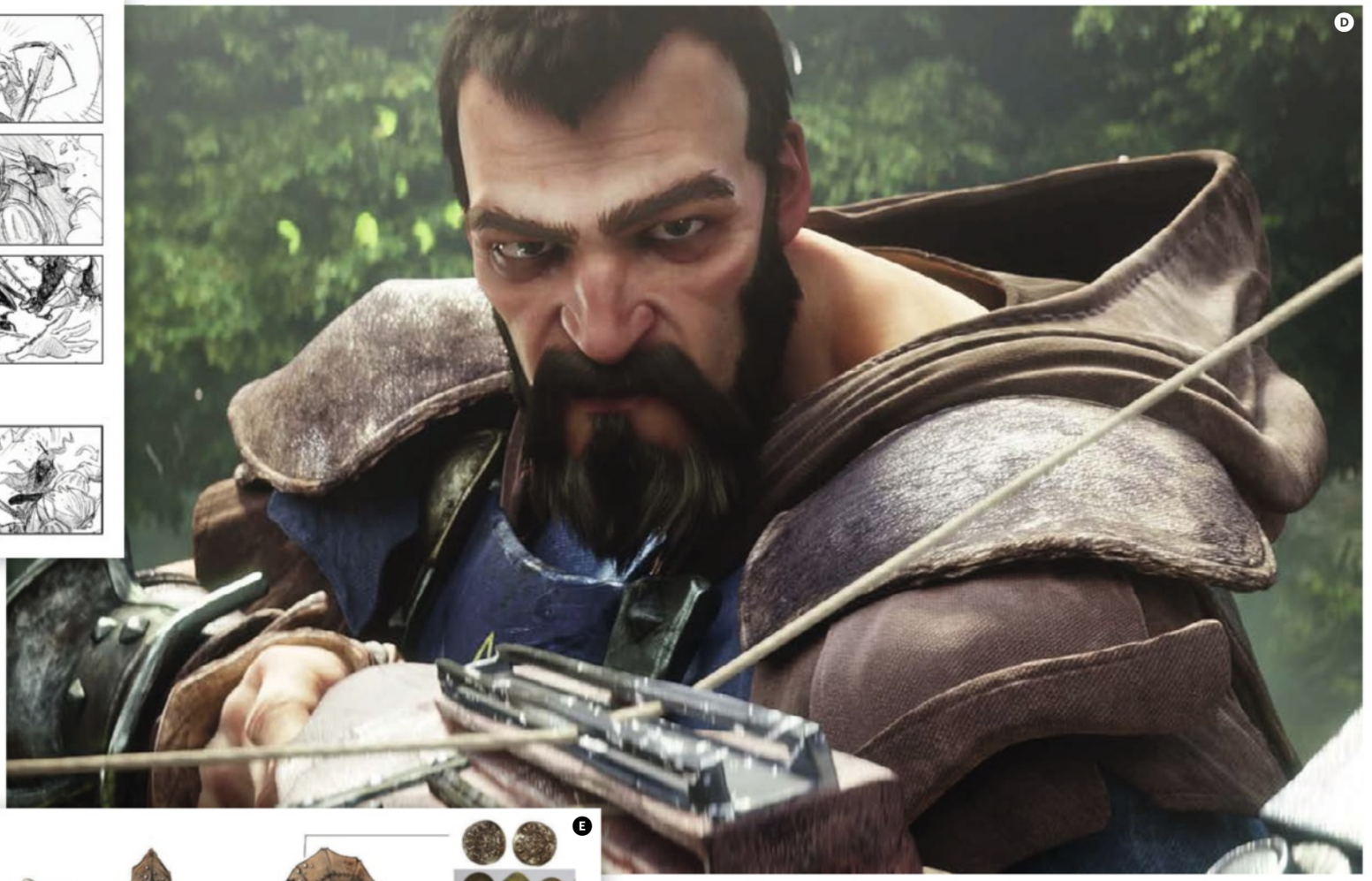
Paula Lacerda
Producer

Debbie Ross
Executive producer

A Finding the right team is an important process. "When it comes to adding new members at Axis we are first and foremost looking for talent and potential. Software skills can be learned, but the built-in talents are harder to develop," explains Scott

B Character animation studio Flaunt was created to further explore projects that were more appealing to a wider audience. More recently, boutique visual effects studio AXISvfx was founded to expand both the animation and VFX sides of the business

C Scott explains that the studio has grown organically over time, with each new project effectively becoming an advert designed to reel in the all-important next round of clients. As ever, *Fable Legends* presented Axis' very best work up to that point



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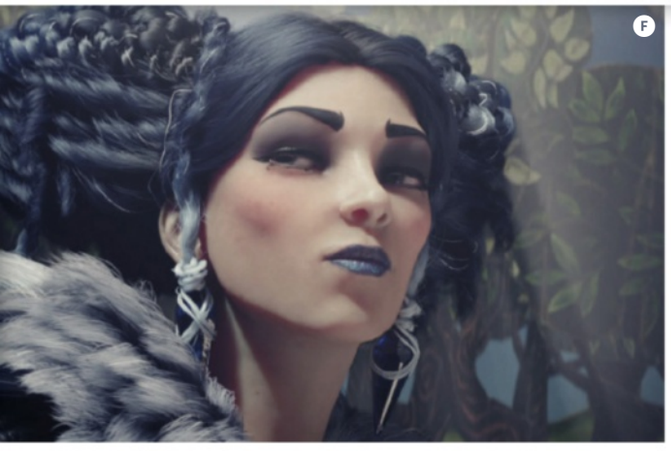

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Organic growth

Richard Scott lists a few approaches that help enhance the quality of the studio's finished work

Scott explains that since co-founding Axis in 2000, each new project has become an advert aimed at drawing in the next client: an approach where great quality within every finished animation is crucial. In fact, with every new pitch, work usually begins by bringing together artists from the team who are already fans of the product, just so the group can hear a detailed opinion from the audience of what they are trying to produce. Artists are also grouped together based on the projects they are working on so that ideas can be easily exchanged, which is a huge advantage throughout production.

work, as well as recently opening new branches to explore different areas of the animation business, such as boutique visual effects studio axisFX and the character animation studio Flaunt (www.flauntproductions.com).

However, Scott explains that one of the biggest successes of this trailer was not just the overall look, but the way the story was told. "It was a challenge to find just the right balance between the stylised silhouettes of the world and the solid realistic feel to the surfaces and shaders. We experimented a lot to find that balance, with lighting playing a very big part in the solution. It is just enough of a twist on the norm for a videogame trailer to give it a stand-out feel."

D "We are excited about the untraditional distribution models that are growing for new content," says Scott. "Things have got exciting, with businesses like Netflix and Microsoft becoming commissioners as well as distributors of content"

E A complex cloth was required for the Narrator character, who is covered head to toe in a hooded cloak. The Axis team needed to develop the previous techniques they had used in order to plan the cloth design more realistically in Marvelous Designer

F Lighting played a big part in the overall look of the project, and saw a great deal of experimentation. The lighting team worked closely with the artists, creating digital matte paintings and compositing all their own shots using the Digital Fusion software

Industry insider

Fausto De Martini

Senior illustrator / digital designer

Fausto De Martini talks about the his successful career working in the field of game cinematics and as a senior illustrator for movies

About the insider

Job Senior illustrator/ digital designer

Education Mostly self-taught, De Martini recently completed a creature design class in Pasadena with the extremely talented Jerad Marantz.

Company website www.faustodemartini.blogspot.com

Biography De Martini is a freelance digital designer and illustrator with experience in the field of videogame cinematics. He recently made the move to work as an art department's illustrator for movies. He is passionate about art and design and always works on personal projects as well as professional ones.

For senior illustrator and digital designer Fausto De Martini, falling in love with 3D was something that happened somewhat unexpectedly while he was co-editor of a videogames magazine in Brazil 16 years ago. "I met a man who was hired to create the media CD to go along with the magazine, containing the videogame demos, and he made a small presentation in 3ds Max of a car with the magazine logo driving down a road. I was really impressed when I learned he was able to do that all at home," De Martini remembers. "Long story short, we planned to do a small videogame project together for which I would have to learn how to model in 3ds Max."

Since then, De Martini has worked towards a successful career creating videogame cinematics for titles such as *World Of Warcraft*, *StarCraft 2* and *Diablo 3*, and has recently started work as an illustrator for films. However, he still remembers the feeling of creating his first primitives: "Realising that all the designs I had in mind could take on a three-dimensional CG form was extremely exciting. It was love at a first sight!"

Can you describe your typical working day as a senior illustrator for movies in LA? It sounds like a dream job!
The day usually starts early, and it depends on the scope of the movie and how many designs need to be developed. The production designer has the tasks lined up for the illustrators, usually with a very large amount of references to show what he has in mind.

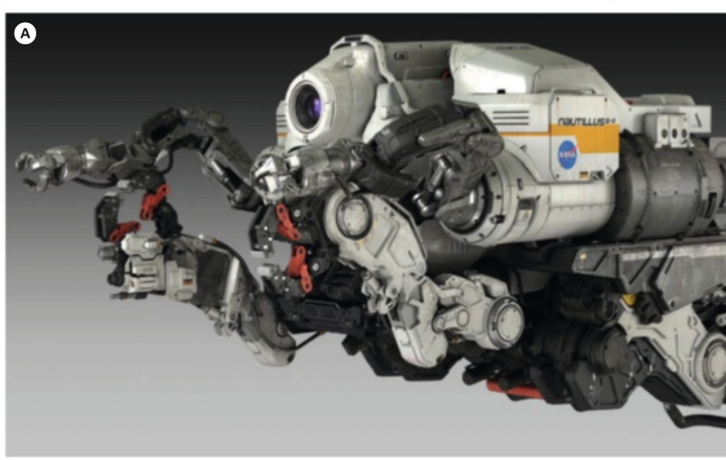
The pace is fast, which pushes me to learn better ways of working to convey a good solid design in less time. Many years ago the industry was much smaller, but nowadays a lot of talented people are out there competing for the same job. I personally love that element, since it drives me to try to improve more, but it definitely adds pressure for everyone. I'm aware that few people are able to do something they love for a living and I cherish these opportunities.

Can you discuss your workflow and how you create your futuristic characters and mechanical images?
I always start by sketching very loose thumbnails and side views using a Pentel Hi-tech pen on paper. If it's a mechanical design, I will then start blocking out the shapes in 3ds Max using pieces from my pre-built 3D library of parts to create a rough design. For creatures I usually start by sketching the overall form, then I move quickly into ZBrush to sculpt, relying heavily on DynaMesh and Clay Tubes to generate the overall mass.

If the design requires a fast turnaround, I will move into Photoshop and paint over using photos to create a sense of complexity and refining. If the design needs to be fully presented at many angles, I push more details within 3D and use my library of shaders to achieve a more finished look. It really depends on the stage of the design or the needs of the director or client.

Can you tell us more about the problems you faced and lessons you learned that you feel helped to get you where you are today?
The main lessons I have learned throughout my career were to work hard and stay humble, as well as to understand that everyone – especially myself – has weaknesses as artists and it's great to be aware of them while always seeking to improve.

I have also always worked on personal projects, regardless of whether or not I was working on the coolest project ever professionally. A lot of projects you work on have very strict NDAs or can get shut off without giving you the chance of to show the work. However, my personal works have always helped me land my next job; I rarely needed to use my professional work to advertise my artistic skills.



Portfolio highlights

Some recent features that Fausto De Martini has worked on:

***StarCraft 2* cinematics**
2007 'Building a Better Marine' – trailer
2010 *Wings Of Liberty*
2012 *Heart Of The Swarm*

***Diablo 3* cinematics**
2008 Teaser Trailer
2007 Official release

***World of Warcraft* cinematics**
2004 Official release
2007 *Burning Crusade*
2008 *Wrath of the Lich King*
2010 *Cataclysm*
2012 *Mists of Pandaria*

2012 *RoboCop* (remake)

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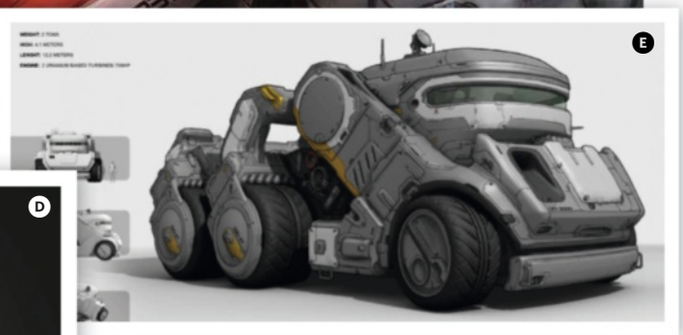

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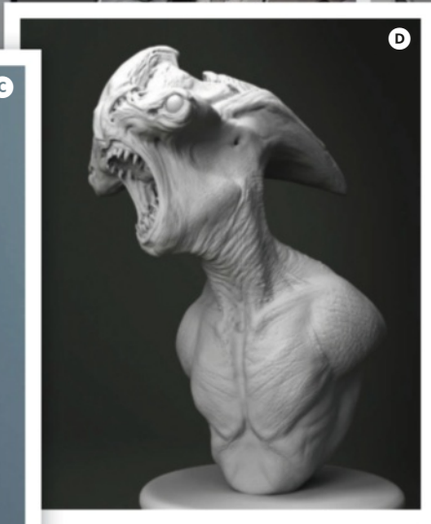

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Changing industries

De Martini tells us about the differences he has found between working on game cinematics and on concept art for feature films

"I feel that quality-wise, videogames and movie concept design are on the same level," explains De Martini. "I think that the main difference is the amount of variations that are required on each design and also the use of more 3D concepts in movies, since a lot of the designs end up being used as props or real set pieces."

> "I love that I get to work with the people that created the work I have admired since I started learning about pre-production in movies"

A De Martini reveals that as he is new in the movie industry he intends to showcase more of his professional work in the future, alongside his personal projects

B "I love the sci-fi and fantasy universes. Movies I watched growing up like *Star Wars*, *RoboCop* and *Blade Runner* had a deep influence on me," says De Martini

C "I use 3ds Max professionally and I'm now using a lot of ZBrush and Marvelous Designer when I need to do cloth designs," De Martini explains

D When working on films, excellent designs need to be produced as quickly as possible on a daily basis. As such, Fausto is always looking for ways to improve

E "Personal work keeps your artistic flame going, and allows for you to test new techniques. It's also great for the portfolio," explains De Martini

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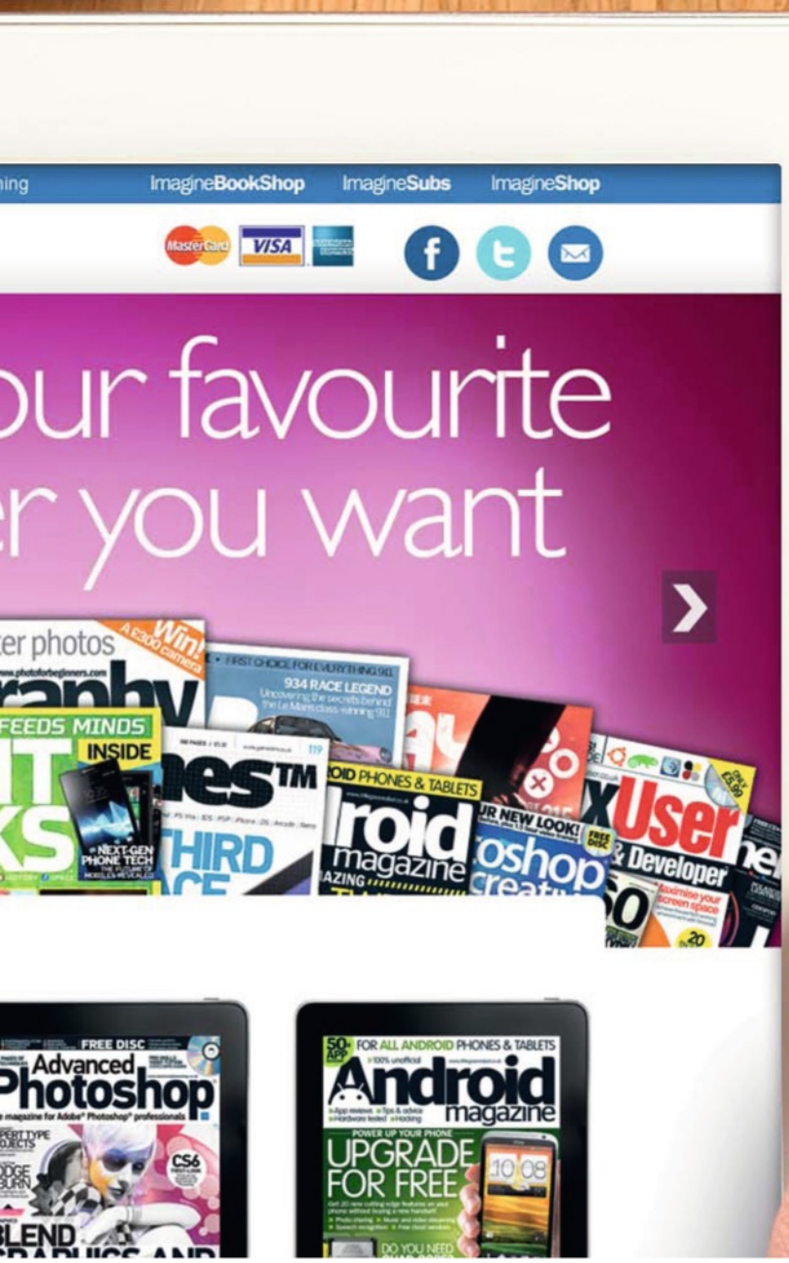

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